REPORT

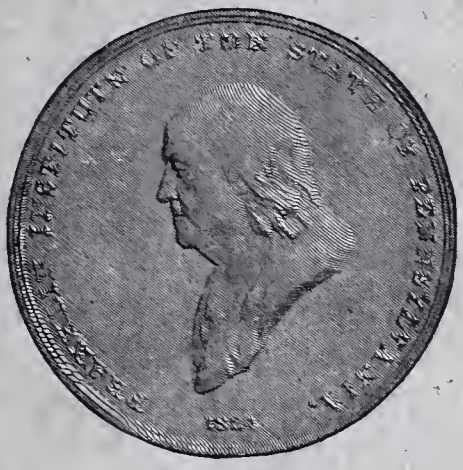
—OF THE—

TWENTY-SEVENTH

EXHIBITION OF AMERICAN MANUFACTURES,

Held in the City of Philadelphia,

From October 6th, to November 12th, 1874.



—BY THE—

FRANKLIN INSTITUTE,

Of the State of Pennsylvania, for the Promotion of the Mechanic Arts.

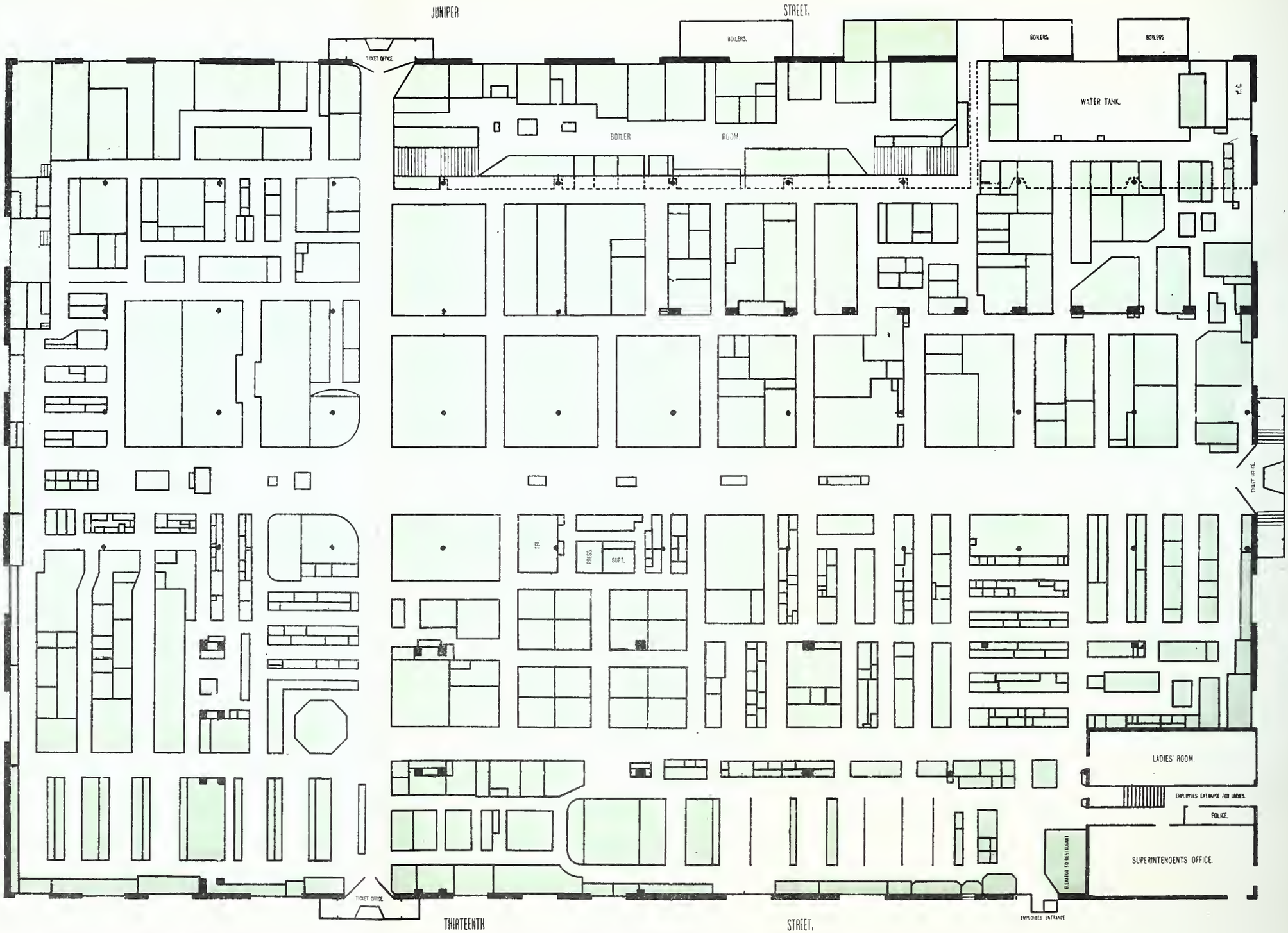
PHILADELPHIA:

WILLIAM P. KILDARE, PRINTER, NOS. 734 AND 736 SANSOM STREET.

1874.

Digitized by the Internet Archive
in 2017 with funding from
This project is made possible by a grant from the Institute of Museum and Library Services as administered by the Pennsylvania Department of Education through the Office of Commonwealth Libraries

https://archive.org/details/reportoftwentyse00fran



PLAN OF FRANKLIN INSTITUTE EXHIBITION BUILDING, 1874.

Photo-Lith by Taylor & Smith, 113 S. Fourth St. Phila.

REPORT

OF THE

TWENTY-SEVENTH

EXHIBITION OF AMERICAN MANUFACTURES,

HELD IN THE CITY OF PHILADELPHIA,

From October 6th, to November 12th,

1874,

BY THE

Franklin Institute,

OF THE

STATE OF PENNSYLVANIA,

FOR THE

Promotion of the Mechanic Arts.

1874.

Officers of the Franklin Institute,

FOR 1874.

President,

COLEMAN SELLERS.

Vice-Presidents,

BLOOMFIELD H. MOORE, HENRY G. MORRIS,
ROBERT E. ROGERS, M. D.

Secretary,

WILLIAM H. WAHL, PH. D.

Treasurer.

FREDERICK FRALEY.

Managers.

WASHINGTON JONES.	JOHN W. NYSTROM.
PLINY E. CHASE.	THEODORE BERGNER.
CHARLES S. CLOSE.	HECTOR ORR.
JOSEPH M. WILSON.	B. C. TILGHMAN.
WILLIAM P. TATHAM.	WM. BARNET LEVAN.
DR. ISAAC NORRIS, JR.	SAMUEL SARTAIN.
THEODORE D. RAND.	CHARLES BULLOCK.
GEORGE F. BARKER.	ENOCH LEWIS.
WILLIAM SELLERS.	WILLIAM HELM.
J. VAUGHAN MERRICK.	F. B. MILES.
HENRY CARTWRIGHT.	EDWIN J. HOUSTON.
HENRY W. BARTOL.	J. E. MITCHELL.

Auditors,

JAMES H. CRESSON, SAMUEL MASON,
WILLIAM BIDDLE.

Actuary.

D. SHEPHERD HOLMAN.

Franklin Institute Exhibition,

— 1874. —

REPORT OF THE COMMITTEE ON EXHIBITION.

To the Board of Managers of the Franklin Institute:

The Committee on Exhibitions, which, under existing By-Laws, is a Committee of your body, respectfully report:

That the Exhibition of 1874, held to celebrate the Fiftieth year of the Foundation of the Institute, proved worthy of the occasion, whether its success be tested by the number and excellence of the articles exhibited, the large concourse of visitors, the instruction and gratification it afforded to the community, or by the pecuniary results.

The first movement towards the Exhibition was at the stated meeting of the Institute held February 18, 1874, when, on motion of Mr. G. Morgan Eldridge, the subject was referred to the Committee on Exhibitions.

The Committee lost no time in addressing a letter to J. Edgar Thompson, Esq., late President of the Pennsylvania Railroad Company, making an application for the use of their depot on Market Street, between Thirteenth and Juniper Streets, for the purpose of an Exhibition. This application having been laid before the Board of Directors, and favorably entertained by it, the President (Mr. Thompson) was authorized to act, which he did by the letter of his assistant, Strickland Kneass, Esq., dated the 17th of March, placing the depot at our disposal during the months of September and October, 1874. Thus, by the exercise of the greatest liberality on the part of the Pennsylvania Railroad Company, the Institute had, for the first time for many years, the opportunity of holding an Exhibition under promising conditions.

At the stated meeting of the Institute held the 18th of March, resolutions were adopted, requesting the Board of Managers to hold

an Exhibition, and to secure a guarantee fund to indemnify the Institute against loss. This condition having been fulfilled, public announcement was made upon the 14th of April, that the Exhibition would be held from the 6th to the 31st of October, thus allowing thirty-five days for the transformation of the building and preparation for the Exhibition, and twenty-six days for the Exhibition itself.

Your Committee, before this time, had been strengthened by adding to it all the members of the Board of Managers, and the assistance of the Institute at large was invoked, resulting in the appointment by the President of one hundred members, for the purpose of forming Committees on the various classes of Exhibits. Some of these gentlemen were appointed upon the standing sub-committees, and acted with the greatest ability, zeal and usefulness. The Class Committees were composed, when possible, of members associated with the various trades and industries. It was made their duty to stimulate exhibitors in their respective classes, and thus to induce an Exhibition which would command the public attention and secure success.

These Committees were also requested to nominate the Judges in their respective classes. It is believed that the policy thus adopted for the first time, had a large influence upon the ultimate success of the Exhibition.

The Committees on Rules, Transportation, and Publication having completed their preparations, a pamphlet containing an address by the Board of Managers, with the necessary information and the Rules governing the Exhibition, was issued upon the 13th of May. The duties of the Committee on Space then began, and were continued all summer, culminating at the opening of the Exhibition. On the 1st of July, Mr. J. B. Knight, who had been actively performing committee work as a member of the Institute, was appointed General Superintendent of the Exhibition.

The Pennsylvania Railroad Company had conditionally promised the use of the depot from the first of September, and the surveys and preliminary arrangements were made by the Sub-Committee on Building and Machinery to accomplish its work in the interval of time allowed it. But, actually, the Company abandoned the depot upon the 19th of August, and we were placed in possession twelve days before the time specified. The advantage thus gained was never lost. The Sub-Committee pushed the work with such energy that the Exhibition building was ready to receive goods about the 1st of September, instead of the 14th, as advertised.

The Committee had been led to expect that the patent boilers to be exhibited would be sufficient to run the machinery of the Exhibition; but it became apparent towards the end of September that this reliance would fail, and arrangements were made to secure other boilers, which were placed outside of the building. In consequence of this disappointment, the steam-power was not ready until the day after the opening of the Exhibition. Considering, however, the great number of Exhibits and the unusual number of machines in motion, the general preparation of this Exhibition was unusually prompt.

The Exhibition was opened by the Governor of the State of Pennsylvania, upon the day appointed, and attracted the sustained attention of the public to such an extent, that it was deemed advisable to continue it open for twelve days longer than was originally designed.

The principal reasons for this extension (which on general principles should be avoided) were, that the great crowds of visitors made it impossible for the Judges to perform their duties satisfactorily, and the same cause excluded from the Exhibition many persons who had bought tickets of admission, over 12,000 of which were outstanding in the hands of the community at the end of October.

The greatest number of tickets paid for and unused, at any one time, was 31,973, upon the 20th of October.

At the close of the Exhibition the number still outstanding was 4120.

The whole number of paying visitors was 267,638, besides members of the Institute, their ladies and minors, and persons admitted on complimentary tickets issued to the press and to others whose liberality it was desired to recognize. Making due allowance for these, it may be said that the Exhibition was visited by one-third of our population. The number of applications for space was 1528. The number of entries for exhibition, many of them covering numerous items and large displays, was 1251. The number of steam boilers in operation was 9, of 316 horse-power in the aggregate, consuming 267 tons of coal. There were 3 steam engines driving shafting, 22 driving pumps, and 11 driving particular machines. The whole number of steam engines at work, or in motion, was 46. The whole number of machines in motion was 281.

Some of the displays were of peculiar excellence. The photographs were particularly good, and would class strictly with the fine arts; but besides these, the variety and beauty of the chemicals dis-

played, the wonder working of the sewing machines, the brilliancy of the saws, the splendor of the chandeliers, the rapidity of the printing press, the precision of movement of the machine tools, and the truth and finish of the paper cylinders, appealed not only to our appreciation of the usefulness of these exhibits, but in addition lent to them the charms and influences of the fine arts.

As a further testimony to the excellence of the exhibition, it appears that although the rule upon the subject of premiums, prepared by the proper committee and adopted by the Board of Managers, was more severe than usual, the premiums awarded under it were more numerous than at any previous exhibition; being 201 silver medals, 228 bronze medals, and 222 certificates of honorable mention, in all 651, while many subjects were recommended to the Committee on Science and the Arts, for the award of the special medals of the Institute.

It is impossible now to state the exact financial results of the exhibition, because some bills are not yet adjusted, and some expenses are still to be incurred. We received for entry account, pulley account, and sale of tickets, $91,947.61, and our expenses are already $37,664.95, and it is estimated they will reach $39,775.95, leaving the sum of $52,171.66 as net profits. It is proposed to publish a full report, embracing the reports of the judges and all matters connected with the Exhibition.

The results of our efforts prove the readiness of our people to visit a meritorious Exhibition, and should encourage the Managers of the great Centennial in hoping for a magnificent success to their undertaking.

It remains to record our thanks to those persons whose liberality, or kindness has assisted us in various ways. The thanks of the Institute are due to the authorities of the Pennsylvania Railroad Company, whose liberality already noticed was followed by repeated acts of like character and by acquiescence in all our requests; to the subscribers to the guarantee fund, who afforded us the first encouragement, a like acknowledgment is none the less due, because the result has exempted them from all liability.

We owe our thanks also to His Honor, the Mayor of the City, for an efficient police force during the Exhibition, and to all the Departments of the City government to whose good offices we were indebted; to the Navy Department for the flags used in decoration, and to

the Treasury Department for the deposit of the life boat at our request; to Messrs. Morris, Tasker & Co. for the liberal use of their gas pipes, and to Messrs. Wm. C. Allison & Sons for a like use of steam pipes, to the American Dredging Co. for the free loan of a new boiler, and to Messrs. I. P. Morris & Co. for a like favor.

It is proper, also, to thank many of the exhibitors who incurred considerable expense merely to serve the purposes of the Exhibition. Among these were Messrs. Jacob Naylor, Andrew Watson, Neafie & Levy, and Robert Wetherill, exhibitors of steam engines; Messrs. Wm. Sellers & Co. and Geo. V. Cresson, exhibitors of shafting; Messrs. Thomas J. Rorer, Sellers & Bros., and Alexander Bros., exhibitors of belts; all used in driving the machinery of the Exhibition. Our thanks are also due to Mr. Thomas Shaw, who at our suggestion exhibited a much larger propeller pump and cataract than he had designed; to Mr. Charles H. Brown for a pump used to supply the outside boilers; to Messrs. Dyott & Co. for the liberal loan of street and door lamps; to Messrs. Cornelius & Sons, Baker, Arnold & Co., Thackara, Buck & Co., and the American Reflector Co., for the loan of gas fixtures; to Messrs. I. P. Morris & Co., who at our request built the fast Bullock printing press and engaged to carry it until sold, in order that it might be placed in the Exhibition; to the judges (not necessarily members of the Institute), who brought to their delicate tasks a special knowledge of the subjects committted to them, and performed their duties with the greatest integrity, assiduity and judgment; and finally, to the public press, which, recognizing the public nature of our enterprise, was a faithful interpreter of the kind feeling of the community towards us.

The labor performed by the sub-committees, particularly by those upon Building and Machinery, and upon Space, were of a character which it would be impossible to buy.

The officers employed in the Exhibition performed their duties with the greatest efficiency, and the Committee take especial pleasure in testifying to the ability, energy and tact of the General Superintendent.

W. P. Tatham,

Chairman Committee on Exhibitions.

Philadelphia, Jan. 18, 1875.

DOCUMENTS AND INFORMATION REFERRED TO IN THE FOREGOING REPORT.

At the stated meeting of the Franklin Institute held March 18th, 1874, Mr. Wm. P. Tatham, from the Committee on Exhibitions, presented a Report of the steps taken by the committee in the matter of holding an exhibition of arts and manufactures in the coming fall, after describing the premises upon which it is proposed to hold the exhibition, and which he stated to be 369 feet long by 250 feet in breadth, containing more than two acres of clear floor space which would be available for exhibition purposes, he read the following letter:

PENNSYLVANIA RAILROAD COMPANY,
President's Office,
Philadelphia, March 17th, 1874.

WM. P. TATHAM, ESQ.

Com. Franklin Institute. My Dear Sir.—I am directed by Mr. Thompson to say, that the freight station at Thirteenth and Market Streets will be at your disposal, for the use of the Franklin Institute, as a place for holding an exhibition, on and after the first day of September next to the close of October, provided we are not prevented from removal by circumstances now unforseen.

Very Respectfully,

STRICKLAND KNEASS, *Asst. to Prest.*

In consideration of the facilities placed at the disposal of the Institute by the letter just read, Mr. Tatham moved the following resolutions, which were adopted:

Resolved, That the Board of Managers are requested to hold an exhibition of American arts and manufactures this coming fall.

Resolved, That the Board of Managers are requested to secure a guarantee fund to secure the Institute against loss.

Resolved, That the thanks of the Franklin Institute are due the Pennsylvania Railroad Company for their prompt and liberal action, and that the President is requested to communicate this resolution to the President of the Company.

GUARANTEE FUND.

Philadelphia, April 3d, 1874.

WHEREAS, at the last meeting of the Franklin Institute of the State of Pennsylvania for the promotion of the Mechanic Arts, the Managers were requested to hold an exhibition of American Arts and Manufactures next Fall, first securing a sufficient guarantee fund to indemnify the Institute in case of loss,

AND WHEREAS, at a Special Meeting of the Board of Managers, held April 2, 1874, the following resolution was adopted:

Resolved, That the Committee on Exhibitions be directed to secure a guarantee fund of TWENTY-FIVE THOUSAND DOLLARS, and thereupon publish notice of our intended exhibition, and prepare the same:

WE, the undersigned, hereby severally bind ourselves to pay to the Treasurer of the Franklin Institute, the amounts set opposite to our signatures, should so much be required, or a proportionate share of any less loss which may be incurred, when ascertained and declared by the Board of Managers of the said Franklin Institute.

NAME.	AMOUNT.	NAME.	AMOUNT.
Geo. W. Childs,	$1000	Christian Faser,	$1000
A. J. Drexel,	1000	A. Purves,	500
W. P. Tatham,	1000	Chas. Bullock,	500
John Baird,	1000	S. Lloyd Wiegand,	500
Wm. Sellers & Co.,	1000	C. S. Close,	500
Allen & Bro.,	1000	Jno. Brown & Co.,	500
A. Whitney & Sons,	1000	Caleb J. Milne,	500
Farrel, Herring & Co..	1000	Francis F. Milne,	500
B. H. Moore,	1000	B. K. Jamison,	500
L. S. Boyer & Co.,	1000	W. C. Allison & Sons,	500
Steam Generator Co.,	1000	J. B. Lippincott & Co.,	500
Fairman Rogers.	1000	Robbins, Clarke & Biddle,	500
Morris, Tasker & Co..	1000	H. G. Morris,	500
J. H. Towne,	1000	Morris, Wheeler & Co.,	500
S. S. White.	1000	I. P. Morris & Co.,	500
Burnham, Parry, Williams & Co.	1000	Wm. Wharton, Jr.,	500
James Moore,	1000	C. W. Wharton,	500
Powers & Weightman,	1000	H. Baldwin,	500
Field & Hardie,	1000	Robert E. Rogers,	250
Fairbanks & Ewing,	1000	F. Oden Horstmann,	250
Chas. Williams,	1000	C. McGarge & Co.,	250
Sam'l F. Prince,	1000	Arch. Iron Works,	250
Collins W. Walton,	1000	Davis & Everson,	250
B. H. Bartol,	1000	J. E. Mitchell,	250
S. V. Merrick's Estate,	1000	McPherson, Willard & Co.,	250
J. E. Caldwell,	1000	Jacob Naylor,	200
Baeder, Adamson & Co.,	1000	Rosengarten & Son,	200
H. Belfield & Co..	1000	Thompson & Bros.,	100
J. Reynolds & Son,	1000	Howe Sewing Machine Co..	100
Hoopes & Townsend,	1000	Elliptical Sewing Machine Co.,	100
13th & 15th Sts. Pass. R. R.,	1000	Weed " " "	100
Thomas Sparks,	1000	Remington " " "	100
Bailey & Co.,	1000	American " " "	100
Lewis Thompson & Co.,	1000	Florence " " "	100
	34000	Total,	46,350

ANNOUNCEMENT.

The Franklin Institute of the State of Pennsylvania for the promotion of the Mechanic Arts, will celebrate the fiftieth year of its foundation by an Exhibition of Arts and Manufactures, to be held in the City of Philadelphia, from the 6th to the 31st of October, 1874.

The Exhibition will embrace all MATERIALS used in the Arts, in every stage of manufacture, from their natural condition to the finished products, and all TOOLS, IMPLEMENTS AND MACHINES, by which the gifts of nature are changed and adapted to the use, the comfort, or the enjoyment of mankind.

The Committee desire to make this Exhibition represent as fully as possible the mechanical improvements of the last half century—to which the Institute has so largely contributed—and all artisans, mechanics, manufacturers and inventors throughout the United States are cordially invited to contribute their best productions, and compete for the prizes which will be awarded to the most worthy.

Every facility will be afforded for exhibiting machines in motion. All persons desiring to exhibit are requested to make early application for floor space or steam power, or for room to exhibit boilers or engines in operation to drive the machinery of the Exhibition.

Foreign materials or manufactures, not entered for competition, will be welcomed and fairly exhibited.

Communications are to be addressed to *The Committee on Exhibitions, Franklin Institute, Philadelphia, Pa.* Detailed information concerning the rules and regulations governing the Exhibition will be sent in reply.

By direction of the Committee on Exhibitions,

W. P. TATHAM, *Chairman.*

Philadelphia, April 14th, 1874.

Committee on Exhibition.

W. P. TATHAM, Chairman.

CHARLES S. CLOSE. FREDERICK FRALEY.
B. C. TILGHMAN. J. E. MITCHELL.

This Committee, by a vote of the Institute, is to be enlarged to one hundred, including all the members of the Board of Managers.

Standing Sub-Committees.

FINANCE.

W. P. TATHAM, Chairman.

JOHN BAIRD. COLEMAN SELLERS.
J. VAUGHAN MERRICK. FREDERICK FRALEY.

RULES AND REGULATIONS.

HENRY CARTWRIGHT, Chairman.

THEODORE BERGNER. JAMES E. MITCHELL.
THOMAS SHAW. ALEXANDER PURVES.

BUILDINGS AND MACHINERY.

CHARLES S. CLOSE, Chairman.

WASHINGTON JONES. ROBERT E. ROGERS, M. D.
JOSEPH M. WILSON. FREDERICK GRAFF.
GEORGE W. EWITT. D. D. WILLARD.
RAPHAEL ESTRADA. JOHN H. COOPER.

Mr. Estrada directed the running machinery during the Exhibition.

SPACE.

CHARLES BULLOCK, Chairman.

FREDERICK GRAFF. ROBERT GRIMSHAW.
JOSEPH M. WILSON. WILLIAM C. EWING.
S. LLOYD WIEGAND. HARTLEY KNIGHT.
W. P. COOPER. CHRISTIAN FASER.
SAMUEL SARTAIN. G. M. WARD, M. D.
JNO. HALL. W. G. ARMSTRONG.

CLASSIFICATION.

PLINY E. CHASE, Chairman.

J. B. KNIGHT. ALEXANDER WILCOCKS, M. D.

TRANSPORTATION.

ENOCH LEWIS, Chairman.

WILLIAM C. EWING. CHARLES FIELD.

CORRESPONDENCE AND PUBLICATION.

PLINY E. CHASE, Chairman.

SAMUEL SARTAIN. EDWIN J. HOUSTON.
GEORGE F. BARKER. J. B. KNIGHT.
G. MORGAN ELDRIDGE.

Mr. Sartain had entire charge of preparing the Admission Tickets during the Exhibition.

ADDRESS OF THE BOARD OF MANAGERS.

To Manufacturers and Mechanics of the United States:

In inviting contributions to an Exhibition which is intended to celebrate the 50th year of the Franklin Institute, the Managers naturally recall the language used by the founders of the Society in their first quarterly report, made to the Institute upon the 15th of April, 1824.

Announcing the intention of holding the first Exhibition of the kind in this country, (which was actually held in the month of October, in the year 1824,) they say:

"An object of equal, if not greater importance * * * "is that of public Exhibitions to which all the products of national "industry may be sent; the effect and consequence of such Exhibi- "tions will necessarily be to extend the reputation of the Institute, to "stimulate the zeal of the members, and to excite a proper degree of "emulation and of justifiable rivalry among the numberless manufac- "turers and mechanics of this city. It is confidently believed that "when the products of our industry are collected from the various "workshops now dispersed throughout the city and state, and exhibited "together, they will form a collection calculated to excite a gratify- "ing sense of pride in the bosom of every well wisher to the pros- "perity of our manufactures, and an encouraging hope that, under "proper regulations, we may soon compete with foreigners in the "manufacture of all useful articles."

These views and hopes have been justified by the success of their pioneer enterprise and of those which followed it, as well as by the general practice now existing, of Annual Exhibitions elsewhere, but more than all, by a comparison of the state of the Arts fifty years ago, with their condition now.

This comparison may, we trust, be facilitated and illustrated by our intended Exhibition. It cannot be denied that much of the general progress of the Mechanic Arts may fairly be attributed to such expositions, and prosperity in many individual cases may easily be traced to the public recognition which our exhibitions have invited. On the other hand, the benefits to the community have been equally great,

and all the motives which were enumerated by our first Board of Managers are fully in operation to-day.

We hope, therefore, when self interest and the desire for the public good both incite us to one line of action, that the parties to whom we especially appeal, may unite to make our proposed display worthy of the occasion.

In the earlier Exhibitions held by the Franklin Institute, a list of premiums offered was published beforehand, but experience proved that many of the Medals were neither earned nor awarded, while the acknowledged excellence or novelty of other articles exhibited, compelled the award of Medals which had not been proposed. The plan was therefore definitely abandoned in 1838, and Medals may now be achieved for any product of Inventive Genius, or by excellence of Execution.

The Scott Legacy Premium, consisting of a Bronze Medal, with the motto, "To the most deserving," together with the sum of $20, is vested in the City of Philadelphia by the provisions of the Will of John Scott, of Edinburgh, made in the year 1816, and the City has confided the trust of awarding the premium to the Franklin Institute. It is a premium of peculiar honor, to be distributed among ingenious men and women who make useful inventions.

The Elliott Cresson Gold Medal, an honor which has rarely been awarded, is also entrusted, by the provisions of his Will, to the Franklin Institute. It may be awarded for some discovery in the Arts and Sciences, or for the invention or improvement of some useful machine, or for some new process or combination of materials in manufactures, or for ingenuity, skill or perfection in workmanship.

Both of these premiums are awarded by the Board of Managers upon the recommendation of the Committee of Science and the Arts.

In order more readily to find experts qualified to act as judges of each class of articles exhibited for competition, the classification will be made according to the position each article occupies in trade, without regard to any rule based upon the use of the article.

The Rules and Regulations adopted by the Board of Managers to govern the Exhibition, and all other necessary information, are hereinafter contained.

By order of the Board of Managers,

D. Shepherd Holman, *Actuary.*

Philadelphia, May 13th, 1874.

FRANKLIN INSTITUTE EXHIBITION, 1874.

RULES AND REGULATIONS.

1. The building, on Market Street between Thirteenth and Juniper Streets, will be opened for the reception of all articles and goods intended for exhibition, on Monday, September 14th, and remain open for that purpose until Saturday, October 3d. On Tuesday, October 6th, the Exhibition will be formally opened to the public at 12 o'clock, M., and continue daily open (Sunday excepted) from 10 A. M. to 10 P. M., until Saturday, October 31st.

2. Each exhibitor will be required to pay Five dollars for each and every entry for competition, at the time the entry is made, and no more than one premium shall be awarded for articles contained in same entry; a *season ticket* shall be furnished to each such exhibitor, *which shall not be transferable.* Not more than one exhibitor's ticket shall be furnished to any one firm or corporation for each entry. Exhibitors may procure tickets for persons necessary for the care and operation of their articles, free of charge, but to be forfeited if used improperly. Articles intended for display only may, at the discretion of the Committee, be entered without fee; but such entry will confer no privileges upon the exhibitor.

3. All applications for space, to be made before October 3d, on printed blank forms, to be furnished by the Committee; and they will be considered and the space allotted, in the order of their receipt. Space allotted to applicants and not occupied by October 3d, may be assigned to other exhibitors. Whenever the articles will admit, contributors are requested to exhibit them in glass cases.

4. All articles delivered at the building shall be reported to the Committee, who will direct their location, and assign them the proper space. Any articles shipped to the Exhibition by rail or otherwise, must have freight and charges prepaid, and invoice and bill of lading mailed to "Committee on Exhibition."

5. Exhibitors will be furnished by the Entry Clerk with duplicate cards, describing each article entered for exhibition; these will be countersigned on the receipt of the articles into the Exhibition. One of these cards shall be conspicuously attached to the article which it describes, and the other must be retained by the exhibitor, and be

presented as his order for the delivery of the article specified, at the close of the Exhibition.

6. The Committee reserve the right to exclude from the premises all articles of a dangerous or offensive character.

7. No articles can be removed from the building, during the time of Exhibition, unless by consent of the Committee.

8. A police force will be in attendance upon the premises during the Exhibition, and watchmen at night; but all articles on exhibition will be at the risk of the owner.

9. There will be two lines of shafting of 2 7–16 inches diameter, one line driven at a speed of 120, and one at 240 revolutions per minute, from which power will be furnished, without charge, for machinery in operation. To secure entire uniformity of motion, all driving pulleys on the line shaft will be supplied by the Institute to the exhibitors, at the lowest trade price. Exhibitors will furnish their own countershafting and belting, all plainly marked with their names.

10. The Judges shall be appointed by the Board of Managers, and shall be men of acknowledged integrity, skill, and experience in the class of articles assigned to them; and no Judge shall serve on any class in which he may be a competing exhibitor, or otherwise directly interested. The mornings of each day, until fifteen minutes before the time of opening the Exhibition, shall be appropriated to the Judges, who shall be attended only by such persons as they may invite to be present.

11. All articles entered for competition will be carefully examined by the Judges, and Premiums will be awarded on such articles as they shall declare worthy—their decisions being based on intrinsic merit, and not because the article happens to be the best exhibited in any particular class.

12. The premiums to be awarded shall be of three classes:

1st. The Silver Medal of the Franklin Institute, with a Diploma or Certificate setting forth the peculiar merits of the article exhibited.

2d. The Bronze Medal of the Franklin Institute, with a like Diploma.

3d. A Diploma or Certificate of Honorable Mention.

Cases of special merit may be referred by the Judges to the Committee on "Science and the Arts," with a recommendation for the

award of the Scott's Legacy Premium, or of the Elliott Cresson Gold Medal.

13. Exhibitors are desired to state in writing to the Committee, the peculiar merits claimed for the articles exhibited by them for competition.

14. Signs will not be allowed of greater size than 300 square inches, nor shall such signs be elevated above the goods.

The distribution of circulars and cards or samples about the building will not be permitted; exhibitors can distribute only from their own stand.

INFORMATION.

THE EXHIBITION BUILDING.

The Pennsylvania Railroad Company being about to vacate their Depot on Market Street, between Thirteenth and Juniper Streets, has, with characteristic liberality, placed the building at the disposal of the Committee on Exhibition.

This building contains more than two acres of available space on the ground floor, besides a large cellar for Storage, and a four story wing at the corner of Thirteenth Street, for Offices, and is therefore by far the largest Exhibition building ever had in Philadelphia.

TRANSPORTATION.

The following Railroad and Steamship Companies have agreed to return free, *over their own lines*, articles which they have carried, intended for the Exhibition, upon which freight has been paid, and which remain unsold.

The paid Freight-bills, countersigned by the proper officer of the Institute, will entitle exhibitors to this privilege.

PENNSYLVANIA RAILROAD COMPANY.
PHILADELPHIA, WILMINGTON AND BALTIMORE RAILROAD COMPANY.
PHILADELPHIA AND READING RAILROAD COMPANY.
NORTH PENNSYLVANIA " "
LEHIGH VALLEY " "
PHILA. AND BALTIMORE CENTRAL " "
WEST CHESTER AND PHILAD'A " "
WEST JERSEY " "

Camden and Atlantic Railroad Company.
Clyde's Steam Lines—To Boston, Providence, New York, Richmond, Norfolk, Charleston and Washington.
Philadelphia and Southern Mail Steamship Co.
Baltimore and Philadelphia Steamboat Co.
Swiftsure Transportation Co.—To New York and Hartford.
Boston and Philadelphia Steamship Line.
Philadelphia and Providence Steamship Line.
Lorillard's New York Steamship Line.

The last three Steamship Lines will make a charge for the handling of Heavy Machinery on the return.

INSURANCE.

Parties desiring to insure against Loss by Fire during this Exhibition, may do so upon a general policy issued to the Franklin Institute, by recording the amount and paying the premium.

WATER SUPPLY FOR PUMPS.

There will be provided a tank of ample dimensions to furnish water to all classes of pumps on exhibition. The depth of water will be about ten feet, its surface reaching to within about four feet of the floor of Machinery Hall.

The floor will extend over the water along one side, so that the suction pipes of large pumps may pass directly into the water without unnecessary bends.

COMPETITIVE TRIALS OF STEAM ENGINES AND BOILERS.

The examination of all Steam Boilers entered for competition, will cover all the qualities comprised in the best types, and include a test of their evaporative efficiency, which shall be one of the elements in determining which is the best.

The chief objects of these competitive trials is, to display and compare publicly the merits of the several Engines and Boilers exhibited.

A secondary object is, to reward the makers of the best Boilers and Engines.

These trials will be made under the following rules.

STATIONARY STEAM BOILERS.

1. Good Anthracite Coal of one of the following brands, viz.: Buck Mountain, Harleigh Lehigh, Honeybrook Lehigh or Locust Mountain, of uniform quality and size shall be used in the furnaces of all Boilers under trial, except in those constructed especially for other kinds of fuel. The unconsumed coal, ashes and clinkers of each trial shall be deducted.

2. The feed-water shall be accurately weighed, and its temperature taken in the tanks each time they are filled, by moving the thermometer through every part of it; and also by a thermometer placed in the feed-water pipe just before it enters the Boiler.

3. The steam shall be maintained in each Boiler, during trial, as nearly as possible at a uniform pressure of 80 pounds per square inch. Where practicable, the dynamic value of the steam will be determined by working it through one and the same steam-engine.

4. Natural draft only shall be used to create and maintain combustion, and its temperature as it enters the ash-pit shall be taken by thermometer; and the temperature of escaping gases by pyrometer placed in the flue, immediately beyond the Boiler, and shall be accurately noted.

5. The evaporative efficiency of each Boiler under trial shall be measured by its economic capacity for generating dry steam under the usual conditions of combustion, and best uniform and continuous management of the fires.

6. The temperature and pressure, and all other conditions of each trial shall be observed and noted at regular intervals, and shall be the same in all the trials as nearly as possible, in order to avoid complex calculations in making comparisons. Any conversions that may be necessary in making comparisons between the results of tests of different Boilers, in consequence of any necessary deviations from the conditions above stated, shall be made by Rankine's formula and tables for such purposes (see "Steam Engines, by Prof. Rankine," pages 254, 255, 256 and 564), and which may also be found published on pages 403 and 404 of the Journal of the Franklin Institute for December, 1873,

7. All the instruments used shall, before and after each trial, be tested in the presence of the Judges, to determine their accuracy, and all the readings of the several instruments shall be correctly noted.

8. The feed-water tanks and pipes shall be placed above ground, so that leaks, if any, may be seen. The pipes leading from the feed-pumps to boilers shall have no branch connections, and the pipe from the tank to pump shall be entirely disconneeted while it is being filled, and the pipe for filling the tank shall be disconnected when the pump is in operation. *All* the appliances used shall be placed in full view, so that they can be observed at all times.

9. Every Boiler shall be used several consecutive days preceding the trial, in order to thoroughly dry the "setting," and the fires shall be kept up all the night previous. On commencing the trial (the furnaces being well heated), the fires shall be drawn—the furnace and ash-pit thoroughly cleaned—a fresh fire kindled, and at the end of the trial the fire shall again be drawn and the unconsumed fuel weighed with the ashes and clinkers.

10. The Judges shall require the different firemen to exercise, as near as may be, equal skill in the management of the fires. Particular care should be taken to observe, during the continuance of the trial, that the uniformity of performance is maintained, and proper account be taken of any variations in the quantity of water or fuel used. No trial shall be of less duration than ten hours.

11. Every person assisting in making the trials, shall be under the control of the Judges, who shall have power to suspend or discharge for cause, and in this, as in all other matters pertaining to the trials, their decision shall be final.

12. In testing Steam Boilers and Engines, the following Record shall be kept, and such other information as shall be deemed of value :

Observations.		Pressure by St'm gauge	POUNDS.		TEMPERATURES.				Intensity of Flue draft in Inches.	Horse-Power.		Height of Water.
No.	Time.	lbs. per Sq. Inch.	Coal	Feed water	Feed water	Steam	Flue	Boiler Room		Per Indicator.	per Dynamometer	
	A	B	C	D	E	F	G	H	I	J	K	L

STATIONARY STEAM ENGINES.

1. The cylinders must be drilled and tapped at each end for half-inch gas pipe, and a cock attached thereto for connecting an indicator.

2. The power of steam engines shall be taken by indicator and by dynamometer or friction brake attached directly to the engine shaft, and to facilitate this, the engine shaft should preferably project twelve inches beyond the outer bearing.

PORTABLE STEAM ENGINES.

1. The method of testing portable Engines shall, as far as practicable, be the same as those prescribed for stationary Engines and Boilers.

2. In comparing results in this class of machines, greater importance will be attached to the effect as shown by indicator and dynamometer, in comparison with the fuel consumption, than to the quantity of water evaporated by the fuel.

The Record, and all other particulars of each test, together with description of Boiler or Engine, including first cost, shall be published in the report of the Judges.

Chimneys shall be furnished by the exhibitors; subject, so far as safety from fire is concerned, to the Committee on Buildings. Each exhibitor shall furnish his own fireman, or pay for same if furnished by the Institute.

The Institute will furnish the fuel for all the boilers in operation, and shall have the use and control of so many as shall be necessary to furnish steam to apparatus and machinery in operation.

EXTRACT OF CIRCULAR ADDRESSED TO MEMBERS OF THE CLASS COMMITTEES.

It will be the duty of the members of the Committees to promote the exhibition of articles embraced in their respective classes, so that every excellence, or novelty, may be brought to the attention of the public, and this Exhibition may be a full and fair representation of the present state of the Mechanic arts, and of the progress made in the last fifty years.

It will afterwards be the duty of each Committee to nominate the Judges of each class assigned to its care. The Judges shall be experts, and whenever possible, acceptable to the competing exhibitors. They will be appointed by the Board of Managers.

Each Chairman should, as soon as practicable, call his Committee together and apportion the work of the Committee, so as to obtain the best results. In order to secure concert of action the General Superintendent, Mr. J. B. KNIGHT is made *ex-officio* Secretary of each Committee, and will call the meetings at the request of the Chairmen, and at such other times as shall be necessary to promote the work. Committee meetings will be held at the Hall of the Institute for the present.

The Committees on Class XXIX, (Models and Machinery), on Class XXXIX, (Heaters and Ranges), and on Class XXVI, (Lamps and Gas Fixtures), are especially charged with the duty of ascertaining and reporting to the Chairman, as early as possible, what exhibits in their respective classes may be available for the purposes of running the machinery of the Exhibition, and of warming and of lighting the building during the Exhibition.

It is particularly desired that each member appointed should signify to the Chairman his acceptance of the position to which he has been assigned.

W. P. TATHAM,
Chairman of Committee on Exhibition.

Sub-Committees on the Various Classes of Exhibits.

I.—AGRICULTURAL IMPLEMENTS.

PROF. ISAAC NORRIS, JR., M.D. WM. B. COOPER.
WM. CAMAC, M.D. C. B. ROGERS.

II.—AGRICULTURAL PRODUCTIONS & ARTICLES OF FOOD.

H. M. HOWE, M.D. DANIEL BAUGH.

III.—ARMS AND MILITARY GOODS.

J. W. NYSTROM. CAPT. C. E. DUTTON, U. S. A.
F. O. HORSTMANN.

IV.—BOOKS, BOOK BINDING, STATIONERY, ETC.

B. H. MOORE. JULIAN SHOEMAKER.
JOS. E. HOVER. HECTOR ORR.
THOS. SINCLAIR.

V.—BOOTS AND SHOES.

H. M. LAING. THOS. R. EVANS.
J. H. BILLINGTON.

VI.—CABINET WARE AND UPHOLSTERY.

CHRISTIAN FASER. WM. C. EWING.
JOSEPH ALLEN, JR.

VII.—CARPETS, OIL CLOTHS AND FLOOR COVERINGS.

JOHN BAIRD. J. W. FORSYTH.
ROBT. GRIMSHAW. HARTLEY KNIGHT.

VIII.—CHINA, GLASS AND PORCELAIN, ETC.

G. MORGAN ELDRIDGE. J. H. BURGIN.
D. D. WILLARD. W. G. ARMSTRONG.

IX.—COACH WORK.

W. D. ROGERS. ABRAM WALKER.
HENRY GARNER. JOSEPH ALLEN, JR.

X.—COAL AND MINERALS.

WM. A. INGHAM. DR. C. M. CRESSON.
DR. WM. H. WAHL. THEO. D. RAND.
PROF. F. A. GENTH. PROF. E. J. HOUSTON.

XI.—COMBS AND BRUSHES.

W. C. EWING, EMILE GEYELIN.
JAMES T. SHINN.

XII.—COPPER, BRASS AND PLUMBERS' WORK AND TIN. WARE.

J. W. FORSYTH. JOHN CANBY.
JAMES BUTTERWORTH. JOHN HALL.

XIII.—COTTON AND WOOLEN GOODS, ETC.

JAMES HUNTER. C. J. MILNE.
WM. E. TRAINER. THOS. SIMPSON.
J. H. BILLINGTON.

XIV.—DENTISTRY AND SURGICAL INSTRUMENTS.

PROF. ISAAC NORRIS, JR. M.D. S. S. WHITE.
DR. ELIAS WILDMAN. J. SOLIS COHEN, M.D.

XV.—DRUGS, DYE STUFFS AND CHEMICALS.

PROF. ROBT. E. ROGERS, M.D. CHAS. BULLOCK.
HENRY BOWER. GEORGE. F. BARKER.
OTTO LUTHY. JAMES T. SHINN.
G. M. WARD, M.D. PROF. E. J. HOUSTON.

XVI.—FINE ARTS AND PHOTOGRAPHY.

SAMUEL SARTAIN. GEO. W. CONARROE.
ALEX. WILCOCKS, M.D. W. G. ARMSTRONG.
GEO. H. FENNEMORE. FRED'K GRAFF.
GEO. W. HEWITT.

XVII.—GENTLEMEN'S FURNISHING GOODS, INCLUDING CANES AND UMBRELLAS.

SAMUEL J. SHARPLESS. WM. CAMAC, M. D.
DR. ISAAC NORRIS, JR.

XVIII.—GOLD AND SILVER WARE, PLATED WARE AND JEWELRY.

G. MORGAN ELDRIDGE. THEODORE D. RAND.
JAMES C. BOOTH.

XIX.—HARDWARE, CUTLERY, ETC.

CHAS. FIELD. C. C. SAVERY.

XX.—HATS, CAPS AND FURS.

G. MORGAN ELDRIDGE. WM. B. COOPER.

XXI.—HOUSE BUILDING MATERIALS, TILES AND TERRA COTTA WARE.

J. E. MITCHELL. J. M. WILSON.
ROBERT P. JOHNSON. JOHN BAIRD.
SAMUEL GOFORTH. GEO. W. HEWITT.

XXII.—HOUSEKEEPING ARTICLES.

B. H. MOORE. EDWARD H. GRAHAM.
HENRY CARTWRIGHT.

XXIII.—INDIA RUBBER GOODS.

JOHN THORNLEY. ROBERT GRIMSHAW.
ALBERT G. BUZBY.

XXIV.—IRON AND STEEL.

HENRY G. MORRIS. CHAS. WHEELER.
ALEX. PURVES.

XXV.—LADIES' FANCY GOODS & WEARING APPAREL.

J. H. BILLINGTON. R. HOSKINS.

XXVI.—LAMPS AND GAS FIXTURES.

HENRY CARTWRIGHT. W. W. GOODWIN.
DR. WM. H. WAHL. THEO. D. RAND.

XXVII.—LEATHER AND MOROCCO.

WM. ADAMSON. W. H. NEVIL.
CHAS. H. ALEXANDER.

XXVIII.—MARBLE, STONE, ETC.

J. E. MITCHELL. J. M. WILSON.
ROBERT P. JOHNSON. JOHN BAIRD.
SAMUEL GOFORTH. GEO. W. HEWITT.

XXIX.—MODELS AND MACHINERY, LUBRICATING OILS, AND ENGINEERS' SUPPLIES.

COLEMAN SELLERS. HENRY G. MORRIS.
WASHINGTON JONES. W. BARNET LEVAN.
ENOCH LEWIS. H. BILGRAM,
D. D. WILLARD. CHAS. A. DOERR.
A. H. MORGAN. J. W. NYSTROM.
THEO. BERGNER. F. B. MILES.
HENRY CARTWRIGHT. B. H. BARTOL.
FREDERICK GRAFF. J. B. KNIGHT.
J. W. ALLISON. JOHN H. COOPER.
THOMAS SHAW. WM. C. EWING.

H. P. M. BIRKINBINE. ROBERT BRIGGS.
A. G. BROOKS. J. BARTLETT BURLEIGH.
ARAD BARROWS. S. LLOYD WIEGAND.
EMILE GEYELIN. JOHN HALL.
T. J. LOVEGROVE. C. CHABOT.
GEO. V. CRESSON. L. L. CHENEY.
WM. TAGGERT. JAMES HUNTER.
D. E. RICE. WM. ADAMSON.
R. ESTRADA. JOHN BAIRD.
CHAS. S. CLOSE. C. J. MILNE.
H. W. BARTOL. B. H. JENKS.
H. M. HOWE.

Division of Sub-Committee on Class XXIX.

1.—GENERATORS OF POWER.

W. B. LEVAN. WASHINGTON JONES.
JOHN H. COOPER. ROBT. BRIGGS.
S. LLOYD WIEGAND.

2.—MOTORS OTHER THAN WATER-WHEELS.

JOHN H. COOPER. THEO. BERGNER.
GEO. V. CRESSON.

3.—MACHINERY OF TRANSMISSION.

THOS. SHAW. EMIL GEYELIN.
J. W. NYSTROM.

4.—MACHINERY OF TRANSPORTATION.

THEO. BERGNER. T. J. LOVEGROVE.
ENOCH LEWIS.

5.—HYDRAULIC MACHINERY, INCLUDING STEAM-PUMPS.

FREDERICK GRAFF. HENRY G. MORRIS.
B. H. BARTOL.

6.—MACHINE TOOLS.

F. B. MILES. WASHINGTON JONES.
C. CHABOT.

7.—WOOD-WORKING MACHINERY.

CHAS. A. DOERR. J. W. ALLISON
L. L. CHENEY.

8.—TEXTILE MACHINERY.

JAS. HUNTER. C. J. MILNE.
D. D. WILLARD. B. H. JENKS.

9.—SEWING MACHINES.

L. L. CHENEY. JOHN HALL.
W. C. EWING. D. E. RICE.

10.—LAUNDRY MACHINERY,

W. B. LeVAN. A. G. BROOKS.
C. CHABOT.

11.—PAPER MACHINERY.

WM. ADAMSON. T. J. LOVEGROVE:
H. G. MORRIS.

12.—ROPE MACHINERY.

J. W. NYSTROM. HENRY CARTWRIGHT.
A. H. MORGAN.

13.—SUGAR MACHINERY AND CHEMICAL APPARATUS.

H. M. HOWE, M. D. ARAD BARROWS.
R. ESTRADA. H. BILGRAM.
J. B. BURLEIGH.

14.—STONE MACHINERY.

JOHN BAIRD. A. G. BROOKS.
A. H. MORGAN. D. D. WILLARD.

15.—GAS MACHINERY.

HENRY CARTRIGHT. CHAS. S. CLOSE.
HENRY G. MORRIS.

16.—LUBRICATING OILS AND ENGINEERS' SUPPLIES.

T. J. LOVEGROVE. J. B. BURLEIGH.
H. P. M. BIRKINBINE.

XXX.—MUSICAL INSTRUMENTS.

J. SOLIS COHEN, M.D. PROF. E. J. HOUSTON.
THEODORE BERGNER, WM. G. ARMSTRONG.
DR. C. M. CRESSON.

XXXI.—PAINTS, COLORS, VARNISHES, ETC.

JOHN G. CRAIG. W. D. ROGERS.
CHRISTIAN FASER.

XXXII.—PAPER HANGINGS.

SAMUEL SARTAIN. GEO. W. CONNARROE.
ALEX. WILCOCKS, M. D. WM. G. ARMSTRONG.
GEO. H. FENNEMORE. FRED'K GRAFF.
GEO. W. HEWITT.

XXXIII.—PHILOSOPHICAL, OPTICAL, AND MATHEMATICAL INSTRUMENTS.

PROF. E. J. HOUSTON.
PROF. ROBT. E. ROGERS, M.D.
ALBERT G. BUZBY.
GEO. F. BARKER.
DAVID BROOKS.
G. M. WARD, M.D.
PLINY E. CHASE.

XXXIV.—PRINTING AND TYPOGRAPHY.

B. H. MOORE.
JOS. E. HOVER.
THOS. SINCLAIR.
JULIAN SHOEMAKER.
HECTOR ORR.
M. RICHARD MUCKLE.

XXXV.—SADDLERY, HARNESS, TRUNKS AND WHIPS.

CHAS. SCOTT.
THEODORE BERGNER.
C. H. ALEXANDER

XXXVI.—SAFES AND BANK LOCKS AND SCALES.

COLEMAN SELLERS.
LOUIS HILLEBRAND.
ENOCH LEWIS.

XXXVII.—SCHOOL FURNITURE AND EDUCATIONAL APPLIANCES.

CHAS. BULLOCK.
PROF. HENRY MORTON.
GEO. F. BARKER.
PLINY E. CHASE.
J. BARTLETT BURLEIGH.

XXXVIII.—SOAPS AND PERFUMERY.

PROF. ROBT. E. ROGERS.
HENRY BOWERS.
OTTO LUTHY.
G. M. WARD, M. D.
CHAS. BULLOCK.
GEO. F. BARKER.
JAMES T. SHINN.
PROF. E. J. HOUSTON.

XXXIX.—STEAM HEATERS, ETC.—HEATERS, RANGES, AND VENTILATORS.

GEO. B. DIXON. S. LLOYD WIEGAND.
ALONZO L. JONES.

CATALOGUE

OF THE FRANKLIN INSTITUTE EXHIBITION, 1874.

List of Exhibitors.

Adams & Stickney,	Philadelphia,	Gas Regulator,.....29-15
Adams, Jno. & Co.	"	Model of Life Boat.....40
Adjnstable Table Co.,	"	Sewing Machine Table 29-9
Advena & Heald,	"	Carriage and Wagon Axles..... 9
Ainsworth, E.	"	Machinists' Supplies.....29-16
Albert, J.	"	Stringed Instruments 30
Albrecht & Co.,	"	Grand and Square Pianos.....30
Alexander Bros.,	"	Leather Belting.....29-3
" "	"	Exeter Sectional Boiler.....29-1
Alexander, Chas. D.	"	Automatic Car Coupling.....29-4
Allen & Bro.,	"	Furnitnre..... 6
Allen, Chas. B.	"	Steam Piston Head.....29-2
Allen, Gates & Bro.,	"	Machine Sewed Boots and Shoes..... 5
Allen's J. J. Sons,	"	Anti-Lamina.....29-16
Allen, Samnel H.	"	Harness Ornaments.....35
Allen. Samuel L. & Co.,	"	Hand Seed Drill and Wheel Hoe..... 1
Allentown Rolling Mill Co.,	Allentown.	Fish Joint.....29-16
Allison & Bannon,	Port Carbon.	Mining Steam Pump.....29-5
" "	"	Boring Machine.....29-6
Allison, W. C. & Sons	Philadelphia.	Wrought Iron Pipe, etc.....29-16
Altemus & Co.,	"	Albums 4
Amer. Button Hole & S. M. Co.,	"	Sewing Machines.....29-9
American District Telegraph,	"	Improved Burglar Alarm.....33
American Machine Co.,	"	Crown Clothes Wringer.....29-10
American Meter Co.,	"	Jet Photometer and Dry Gas Meter.....29-15
American Reflector Co.,	"	Day and Gas Light Reflector.....26
American Steam Safe Co.,	"	Safes 36
American Tubular Iron and Steel Association.	Philadelphia.	Combined Iron and Steel.... 24
American Tubnlar Iron and Steel Association,	Philadelphia.	Tubular Wrought Iron.....24
Andrews, E. W.	New York.	Improved Lockwood Battery... ... .33
Andrew, Fred. H.	Philadelphia.	Afghan.....25
Andrews, Thos. J.	"	Gold and Silver Washing Machine.....29-14
Applegate, A. & R. O.	"	Centennial Ironing Table.....22
Ash, John S.	Bucks County, Pa.	Water Power Pump.....29-5
Ashcroft, E. H.	Boston.	Steam Gauges.....29-16
Ashton, E.	Philadelphia.	Worsted Doubler.....29-8
Atmore & Son,	"	Mince Meat, etc..... 2
Aub, Hackenburg & Co.,	"	Machine and Sewing Silks.....13
Aurocker, Thos. H.	"	Fire and Burglar-Proof Locks.....36

Austin & Obdyke,	Philadelphia.	Corrugated Exp. Water Conductor.....21
Automatic Telegraph Co.,	"	Automatic Telegraph Instruments.....33
Bacon, Murray	"	Hand Lathes.....29-6
" "	"	Rotary Circulating Fan.....29-3
Bailey, F.	"	Ready Mixed Paints.....31
Bailly, L. A.	"	Equestrian Statue and Models.....16
Baird, H. C.	"	Industrial Books..... 4
Baker, Arnold & Co.,	"	Gas Fixtures.....26
Baker, Charles Henry	"	Self-Gauging Bessemer Tuyeres,.....29-16
Baker, John C. & Co.	"	Cod Liver Oil.....15
Baldwin, Wm.	"	Steel Forgings, Hammers, etc.....19
Bancroft, J. A. & Co.	"	School Apparatus.....37
Bancroft, Sarah H.	"	Sick Man's Chair.....40
Barber, Wm.	"	Case of Medals.....16
Barker, Geo. R.	"	Comb. Heating and Ventila'g App'tus..39
Barlow, C. Joseph	"	Designs in Paper Hangings.....32
Barnett, G. & H.	"	Files.....19
Barrows, Savery & Co.,	"	Refrigerators.....22
" " "	"	Hollow Ware and Sad Irons.....19
" " "	"	Cluster Pots for Ranges, etc.....39
Bartlett, Wm. F.	"	Boots and Shoes 5
Bartol, H. W.	"	Beet Sugar..... 2
Bate, Wm. T.	"	Wash Stand Faucet.....12
Bate, Wm. T.	Conshohocken, Pa.	Patent Heater Filterer.....29 2
Baugh & Sons,	Philadelphia.	Sectional Mills.....29-13
Bayliss & Darby,	"	Wire Work.....19
Becker & Co.,	New York.	Balance of Precision.....33
Bedichimer, Isaac	Philadelphia.	Jewels and Emblems.....18
Belfield, H. & Co.	"	Steam Gauges and Steam Fittings.....29-16
Bement, Wm. B. & Son	"	Machine Tools.....29-6
Benerman & Wilson,	"	Photographic Publication.....16
Benezet & Co.	Philadelphia,	Carriage and Wagon Springs..... 9
Benkert, C. & Son,	"	Boots and Shoes..... 5
Benner, Joseph,	"	Sewing Machines.....29-9
Benton, J. D.	"	Gold and Silver Models 18
Betanelly & Co.	"	Products of Caucasus, Russia.....40
Betts, E. & A.	Wilmington, Del.	Machine Tools.....29-6
Bihn & Co.	Philadelphia,	Lamp Black.....31
Billings, Jno. E.	Boston, Mass.	Models of Universal Angle Bricks.....21
Billington, J. H. & Co.	Philadelphia,	Belting and Pumps.....29-5
Bing, Jas.	"	Mangle or Calender.....19-10
Bird, John,	"	Press for Moulding Glassware.....29-6
Birge & Berg,	"	Artificial Flowers and Millinery.....25
Blake Hose Assn.	Boston, Mass.	Hydraulic Hose.....29-3
Blaisdell, James H.	Philadelphia,	Wood Working Machinery.....29-7
Blatchley, Chas. G.	"	Ice Cream Freezers.....22
Blatchley, Chas. G.	"	Cucumber Wood Pump.....29-5
Boland Bros.	"	Hames.....35
Boland, Fred.	"	Looking Glass and Picture Frames..... 6
Bonwell, W. G. A.	"	Electro-Magnetic Mallet.....33
Booth, Jno. & Son	"	Carpenters' Tools.....19
Borden Meat Pres'g Co.	"	Extract of Beef.....15
Boughton, J. W.	"	Wood Carpet and Parquet Floor..... 7
Boughton, S. G.	"	Glass Ware..... 8
Bonthaux & Weber,	"	Crayon Portraits.....
Bower, Henry	"	Chemical Preparations.....15
Boyd, G.	"	Aroma Coffee Roaster and Cooler..... 2
Boyer, W. L. Bro.	"	Agricultural Implements..... 1
Boyer, L. S. & Co.	"	Coals.....10
Braeh, I.	"	Water Cooler and Filterer.....22

Brainerd, Armstrong & Co.	Philadelphia.	Spool Silk and Cotton.....13
Braun, Fredk.	"	American Calf Skins.....27
Breuker & Kessler,	"	Lithographed Bonds.....16
Bridesburg Man. Co.	"	Looms.....29-8
Briggs, C. M.	"	Magic Lantern Slides.....33
Brill, J. G. & Co.	"	Street Car and Starter.....29-4
Brintzinghoffer, Chas.	"	Horse and Carriage Brushes.....11
Broadbent & Phillips,	"	Photographs.....16
Bromley Bros.	"	Carpetings..... 7
Bromley, John & Son	"	Carpets 7
Brooks, T.	"	Photographs 16
Brooks, William	"	Millinery, Hats, Bonnets, etc.....25
Brown, Edward	"	Pyrometers and Indicators.....29-16
Brown, Charles H.	"	Selden direct acting Steam Pump.....29-5
Brown, D. S	"	Gloucester and Ancona Prints.....13
Brown & Carver,	"	Paper Cutting Machines.....29-11
Bruner, J. S.	"	Spinning Yarn.....13
Bryan, J. C.	"	Lightning Rods.....33
Bryant, Geo. B.	"	Self Lubricating Car Wheels.....29-4
Bruce, E. M. & Co.	"	Estey Cottage Organ.....30
Buck, I. D.	Conshohocken.	Washing Machine..... 22
Bullock & Crenshaw,	Philadelphia.	Pharmaceutical Preparations.....15
Bullock, C K	"	Portable Grain Mill, etc..... ...29-13
Bullock Printing Press Co.	"	Printing Press.....34
Burk, Wm. B.	"	Corks and Sponges.....15
Burkhardt, Geo. J. & Co.	"	Vats and Tanks..... 29-11
Burkhardt, Geo. J.	"	Improved Scotch Mashing Machine and Grains' Valves.....29-13
Burkhardt, Wm. H.	"	Cedar Ship Tank.....29-11
Burnham, Chas. & Co.	"	Transportation and Safety Cans.....12
" "	"	Weather Strips.....21
" "	"	Gas Heating and Cooking Stoves.....39
Burlington Woolen Mills,	Winooski Falls, Vt.	Kerseys, Black and Colored Cloths, Doeskins, and Beavers.....13
Burwell, Wm., & Bro.	Philadelphia.	Carriage Mountings..... 9
Butterworth & Son,	"	Drying Machine.....29-8
Buzby, A. G.	"	Optical Instruments.....33
Buzby, C. Ernest	"	Water Color Drawing.....16
Butz, Alfred L.	"	Corks and Corkwood.....15
Caldwell, James E. & Co.	Philadelphia.	Silver Ware, Jewelry, etc.....18
Caldwell, John A.	Pittsburg.	Slide Valve Calculator.....29-2
Campbell, Sam'l	Philadelphia.	Cologne Waters, etc.....38
Campbell, S. P. & Co.	"	Children's Carriages..... 9
Canby, Jno.	"	Model of House Pump.....29-5
Carbutt, Jno.	"	Photo-Mechanical Printing.....16
Carpenter & Latimer,	"	Keystone Dress Shirts.....17
Carrick, D. & Co.	"	Crackers, Cakes, and Biscuit..... 2
Carrington, DeZouche & Co.	"	Window Curtains and Furniture..... 6
Chambers, Bro. & Co.	"	Book and Paper Folding Machines.....29-11
" " "	"	Brick Machine.....29-14
Chambers, Cyrus, Jr.	"	Gold Miniature Engine.....29-2
Chapman Valve Man. Co.	Boston.	Gas, Water, and Steam Valves.....29-16
Chase, Frederic	Philadelphia.	Porcelain Lined Water Pipe.....21
Chase Manuf. Co.	New York.	Pipe Cutting Machine.....29-6
Chase, Pliny E.	Newark, N. J.	Foot Lathes.....29-6
Childs, Geo. K.	Philadelphia.	One-Man Wagon..... 9
Chillman, P. Edward & Co.	"	Photographs 16
Chipman, Geo. W. & Co.	Boston, Mass.	Carpet Linings and Stair Rods..... 7

Gills, Wm.	Philadelphia.	Patent Tobacco Box.....40
Clark Bros.	"	Cam and Eccentric Rivet Pipe Tongs...29-16
Clarke, J. H.	"	Model of Railroad Car.....29-4
Clark, Thomas J.	"	Organ Pipes.....30
Clark, C. W.	"	Window Shades, Cloth and Fixtures.... 6
Clayton, W. L.	"	Fine Shirts, Old and New Style.....17
Crane Brothers	Westfield, Mass.	Paper Belting, Paper Blankets, etc..... 4
Cohen, Charles J.	Philadelphia.	Envelope Machine.....29-11
Cohen, Robert L.	"	Gas Machine.....29-15
Coates, Wm. Bailey	"	Folding Lounges..... 3
Cohansey Glass Co.	"	Glassware, Fruit Jars, etc..... 8
Colladay, Trout & Co.	"	Willimantic Spool Cotton.....13
Collender, H. W.	New York.	Billiard Table..... 6
Collinge, John T.	Philadelphia.	Model of Diligent Hose Carriage..... 9
Collings Brothers,	"	Carriages..... 9
Colton, F. B.	"	Aquometer Steam Pump.....29-5
Collins & Curl,	"	Automaton Gas Regulator.....29-15
Conde, C. A. & Co.	"	Steam Pumps.....29-5
Connery, James W.	"	Boiler Calking.....29-1
Conrad & Murry,	"	Anti-Friction Metal.....29-16
Conway, William,	"	Soaps.....38
Cook & Brother,	"	Hosiery Goods.....25
Cooper, Joseph W.	"	Fancy Cabinet Ware..... 6
Cooper, Jones & Cadbury,	"	Lathe.....29-6
" " "	"	Plumbers' Supplies.....12
Cooper, P. F.	"	Photographs and Ivorytypes.....16
Cornelius & Sons,	"	Gas Fixtures and Lamps.....26
Cornish, T. E.	"	Electric Burglar Alarm.....33
Coyle, Hugh B.	"	Iron Bedstead..... 6
Cramp William & Sons,	"	Pumps.....29-5
Cramp, William & Sons,	"	Model of Steamship Pennsylvania.....29-4
Crane Bros.	Westfield, Mass.	Paper..... 4
Cremer, James	Philadelphia.	Stereoscopic Pictures.....16
Cresson, George V.	"	Shafting, Hangers, Pulleys, etc.....29-3
Creswell, S. J., Jr.	"	Cast Iron Column.....24
Crew, Emmor,	Opeliska, Ala.	Working Model of Railway.....29-4
Crew, Moore & Levick,	Philadelphia.	Oils.....29-16
Crisswell, Isaac C.	"	Baby Carriages..... 9
Crosscup & West,	"	Wood Engraving.....16
Crossley, Charles,	"	Mill Picks and Patent Pick.....29-6
Cummings, W. A.	"	Pneumatic Coupling.....29-4
Cushman, Cyrus S.	"	Sewing Machine Attachments.....29-9
Cutlan Shoe Sew. M. Co.	"	Sewing Machine.....29-9
Davis, O. F.,	Philadelphia,	Sewing Machines.....29-9
Davis & Dubois,	"	Tallow Cup.....29-16
Davis & Foulke,	"	American Road Steamer.....29-4
Daughaday, J. W.,	"	Printing Press.....34
Deetz, Edward,	"	Sofa Bedstead..... 6
De Morat, O. B,,	"	Photographs.....16
Denver & Rio Grande R.R. Co.	"	Coal & Coke.....10
Depuy, Thomas,	"	Carpets..... 7
Drury & Melluish,	"	Plaster Ornaments, &c.....21
Dexter, E. M.,	"	Confectionery..... 2
Diamond Drill Co.,	Pottsville,	Diamond Drill.....29-14
Dienalt & Eisenhardt,	Philadelphia,	Carpet Loom.....29-8
" "	"	Hydraulic Jack.....29-6
" "	"	Diamond Mill Stone Machines.....29-14
Dieterich, D. P.,	"	Vulcanite Emery Wheels.....26-6
" "	"	India Rubber Goods.....23
Dietrich & Whittington,	Wilm'gton, Del.	Marbled Leather.....27

Dempsey Wicker Covered G. W. Company,	Philadelphia,	Wicker Covered Bottles..... 8
Disston, Henry & Sons,	"	Saws and Tools.....19
Dixon, Thos. S. & Sons,	"	Grates, Gas Logs, etc..... 39
Dodge, Theo. A.,	Boston, Mass.,	Grinding Machine for Wet Substances.29-13
Doerr & Sloan,	Philadelphia,	Cod Liver Oil.....15
Dreer, Smith & Dreer,	"	Gas Sunlight Apparatus.....26
Dreka, Louis,	"	Stationery and Samples of Engraving..16
" "	"	Dictionary Blotter..... 4
Doran, Miss Maggie M.,	"	Glove Making.....25
Drown, Wm. A. & Co.,	"	Umbrellas 17
Duryea Glen Cove Starch Co.	New York,	Starch, Maizena and Corn Starch..... 2
Dunham, J. K.	Philadelphia,	Glassware 8
Dyott, M. B. & Son,	"	Street Lamps.....26
Eadline, G. W.	"	Sterrick's Pat. Wheel..... 9
Earle, James S. & Son,	"	Mirrors, Picture Frames, etc..... 6
" " "	"	Rogers' Groups.....16
Eayre, Richard,	"	Shirts 17
Ebert, M.	"	Serpentine Stone.....28
Eecles, James,	"	Model of Bridge Centre..... 29-3
Eekfeldt & Richie	"	Oak Leather for Hose and Belting.....27
Eelipse Lubricating Oil Co.	"	Oils.....29-16
Eldridge, G. Morgan	"	Patent Damper.....39
Elkins, W. L.	"	Oils.....29-16
Elkinton, J. S. & T.	"	Silicate of Soda 15
" " "	"	Soap.....38
Entrikin, W. G.	"	Oscillating Enameler.....16
Enterprise Manufacturing Co.	"	Coffee, Drug and Spice Mills.....19
Erskine & Co.	"	Ladies' Shoes..... 5
Esterbook Steel Pen Company.		Pens..... 4
Etting, Edw. J.	Philadelphia,	Allentown Pig Iron.....24
Evans, Thomas R.	"	American Gaiter..... 5
" "	"	Boot and Shoe tree Stretchers.....29-16
Everett, B. C.	"	Trusses..... 14
Ewing, D. S.	"	Sewing Machines.....29-9
Excelsior Brick and Stone Co.	"	Improved Brick Press.....29-14
Fairbanks & Ewing,	"	Scales.....36
Faller, G J.	"	Sewing Machine Oils.....29-16
Farr Alpaca Co.	Holyoke. Mass.	Alpaca Lustres and Brilliantines.....13
Farley, Robert H.	Philadelphia,	Champion Steam Washer.....29-10
Farrel, Herring & Co.	"	Safes.....36
Farson, E. S. & Co.	"	Refrigerators, etc..... 22
Faser, Christian	"	Mirrors and Frames..... 6
Fell, C. J. & Bro.	"	Spices and Mustard, and Self-raising Flour..... 2
Felt, A. B. & Co.	"	Vertical Feed Sewing Machine 29-9
" " "	"	Concert Organs.....30
Ferguson, B. F.	"	Ivorytypes.....16
Ferree, Samuel P.	"	Five Color Chromotype Printing.....34
Ferrell & Jones,	"	Tank and Boiler Feed Pumps..... 29-5
Ferris & Miles,	"	Machinists' Tools.....29-6
Field & Hardie,	"	Hardware.....19
Fields, William	"	Battery, Dumping Cart, etc..... 9
Fiss, Banes, Erben & Co.	"	Worsted Yarn.....13
Fitzgerald & Ferry,	"	Novelty Gas Machine.....29-15
Fitzgerald, Flagg & Co.	"	Cast Steel Castings.....24
Flanders, L. B.	"	Boring Machine.....29-6
Fleisher, S. B. & M.	"	Braiding Machines..... 29-8
Fleisher, S. B. & M.	"	Star Braid.....13

Fleming, Jas.	Philadelphia.	Carriages..... 9
Florence Sewing Mach. Co.	"	Sewing Machines.....29-9
" " "	"	Skates.....19
Ford, F. G.	"	Pail, Sieve and Hod combined.....22
Forster & Stowell,	"	Sphynx 14
Forsaith, S. C. & Co.	Manchester, N. H.	Palmer Power Spring Hammer.....29-6
Foster, J. A.	Philadelphia.	Artificial Limbs.....14
Fricke, Arthur	"	Perfumery.....38
Fries, Julien P.	"	Relay Switch Sounders, etc.....33
Frishmuth, Bro. & Co.,	"	Fine Cut Tobacco, "Luxury,"..... 2
Frohock, Wm. T.	"	Suspension and Running Gears..... 9
Frost, C. J.	"	Electrical Fire Detector.....33
Fry's Engraving Office,	"	Book Binders' Dies and Tools..... 4
Fuguet, Stephen & Sons,	"	Key West Havana Cigars..... 2
Fuller, Warren & Co.,	Troy, N. Y.	Heaters, Ranges and Stoves.....39
Fulton, Walker & Co.,	Philadelphia.	Wagons, etc..... 9
Galvano Faradic Man'fg Co.,	N. Y.	Electrical Instruments.....33
Gardner, C. J.	Philadelphia.	Saw Grinding Machine, (Model).....29-6
Gardner, Wm. D.	"	Carriages..... 9
Gardner, Wm. H.	"	N. Y. Folding D. M. Table..... 6
Garner, W. & Sons,	"	Wagons and Wheels 9
Gavit, A. M.	"	Paper Testing Machine.....29-11
Gavit, Gordon	"	Chilled Calender Rolls.....29-11
Gavit, Nelson	"	Pat. Cone Pulley Paper Cutter, etc.....29-11
Gawthrop, A. & Son,	"	Hydraulic Ram.....29-5
Geddes, Wm. F.	"	Fruit and Can Labels, in colors.....16
Gefrorer, C.	"	Gas Burners, etc.....26
Ghrisky, Charles M.	"	Portable Forge 29-6
Gibson, J & G. H.	"	Stained Glass..... 8
Gill, B. & Sons,	Trenton, N. J.	Thresher and Cleaner..... 1
Godfrey, John	Philadelphia.	Hospital Bed Elevator, etc.....14
Goff, R. W. P.	"	Fancy Cabinet Ware..... 6
Goodell, Braun & Waters,	"	Wood Working Machinery..... 29-7
Goodel & Waters,	"	Iron Castings 24
Goodyear, R. B.	"	4-shuttle Loom.....29 8
Gordon, A. Dunlap	"	Concrete Felt 29-16
Gossin, F.	"	Terra Cotta Statuary Vases, etc.....21
Graf Brothers,	"	Transferable Autographic Ink..... 4
Graff, Francis	"	Patent Carpet Fastener..... 7
Graham, Emlen & Passmore,	"	Phila. Lawn Mower..... 1
Graham, John T. & Co.	"	Type Writer.....34
Gratznowskey, Wm.	"	Spring and Hair Mattress..... 6
Gravenstine, John	"	Refrigerator and Cooler.....22
Green, Robert M.	"	Soda Water Apparatus.....15
Greene & Platt,	"	Improved Fire Extinguishers.....29-15
Grier, Geo. S.	Delaware.	Model Bevel Ship-Saw.....19
Grimshaw, R.	Philadelphia.	India Rubber Goods.....23
" "	"	Prunty's Auto. Relief Valve.....29-5
Grover & Baker S. M. Co.	"	Sewing Machines.....29-9
Gropengiesser, Job L.	"	Astronomical Clock..... 33
Gulager, Louis W.	"	Funnel Strainer... 40
Gulager, William	"	Chemical Preparations 15
Gumpert, Charles L.	"	Portrait of William Cramp.....16
Gutekunst, F.	"	Photographs.....16
Hagner, Thos. B.	Philadelphia.	Am. Automatic Filterer.....22
Hale, Kilburn & Co.	"	Cabinet Ware and Picture Frames 6
Hale & Manley,	"	Glass Labels..... 8
Hall, Chas. B.	"	Indelible Marking Stamp.....22

Hall, C. Henry & Co.	Philadelphia.	Pulsometer Steam Pump....29-5
Hall, L. C. Jr. & Co.	"	Machine Twist....13
Hamilton, Turner	"	Books.... 4
Hance, Bros. & White,	"	Percolating and Filtering Apparatus, and Chemical Preparations....15
Hand, James C. & Co.	"	Corundum....10
Hand, S. Ashton	"	Lawn Mower.... 1
Hansell & Bro.,	"	Percolating and Filtering Apparatus...15
Hanson, W. R. & Son	"	Pat. Imp'd Combination Felting....29-16
Hanson & Kirk,	"	Cemetery Lot Enclosures....24
Harden, John H.	"	Drawing Board Trestles....37
Hardy & Yarnall,	"	Preserved Natural Flowers....16
Harkness, William	"	Steiner Gas Machine....29-15
Harrington, Edw. & Son	"	Iron Working Machinery....29-6
Harrisburg Foundry and Machine Co.		Machinists' Vise....19
Harrison Boiler Works,	Philadelphia.	Sectional Boiler....29-1
Harrison, W. H.	"	Double Acting Pumps....29-5
Harrison, W. H. & Bro.	"	Warm Air Furnaces and Grates....39
Harrison Bros. & Co.	"	Paints, Colors, and Chemicals....31
Harris & Griffin,	"	Dry Gas Meter....29-15
Hartford Pump Co.		Machine for raising Water by Compressed Air...29-5
Hartell & Letchworth,	Philadelphia.	Sand Blast Glassware.... 8
Hastings & Co.	"	Gold and Silver Leaf and Gold Foil....18
Haughvout, E. V. & Co.	New York.	Universal Presses....34
Hayes, Coulter & Co.	Philadelphia.	Heaters and Ranges....39
" " "	"	Marbleized Slate Mantels....28
Hayes, J. P. & Bro.	"	Ranges, Gas and Fluid Stoves....39
Hazzard, W. B.	"	Clothes Wringer, etc....22
Heacock, Wm.	"	Bedroom Furniture, etc 6
Heath, Matilda	"	Marble Work....28
Heaton & Denckla,	"	Sash Chair, with Pat. Attachment and Door Butts....19
Heller & Brightly,	"	Surveying and Engineering Instrs....33
Hemple, A. H.	"	Photographs....16
Henis, Chas.	"	Patent Saw Filing Machine. 19
Henkle, G. J. & J. H.	"	Chamber Furniture.... 6
Henry, Frank	"	Goodrich S. Machine Attachments....29-9
Herder, L. & Son,	"	Shears and Scissors....19
Herzel, T. G.	Wilmington, Del.	Bolt and Rivet Cutter....29-6
Herzberg & Bro.	Philadelphia.	Centennial Umbrellas, etc....17
Hess, Eli	"	Marble Mantels, etc....28
Hess, Jno. M.	"	Hanging Baskets, etc.... 1
Heyl, Henry R.	"	Pat. Wire Fastened Paper Boxes....40
Hidden & Hanmore,	"	Pat. Imp'd Combination Felting....29-16
Hietel Bros.	"	Pat. Spring Lever Escapement....18
Heginbothom, Joseph	"	Shafting, Coupling and S. Valve....29-3
" "	"	Oscillating Steam Engine....29-2
Hildebrand & Wolf,	"	Locks....19
Hill, Clark & Co.	Boston.	No. 3 Brainerd Mill and Index Miller..29-6
Hillman, Lewis	Philadelphia.	Measuring and Bolting Machines....12
Hoehhauser, W.	New York.	Morse Register....33
Hoffman, J. & Sons	Philadelphia.	Pearl Handles, Studs, etc....17
Holman, A. J. & Co.	"	Bibles, etc.... 4
Holzer, William	"	Druggists' Glassware.... 8
Hoopes, Bro. & Darlington,	W. Chester.	Shafts, Carriage and Wagon Wheels.... 9
Hoopes & Townsend.	Philadelphia.	Bolts, Nuts, and Washers....19
Hopkinson & Bro.	"	Mirror Reflector, etc.... 7
Hopkins & Dickenson,	"	Revolving Board of Hardware....19
Horne, Cyrus	"	Burial Casket.... 6
Horstmann Bros. & Co.	"	Military Goods, etc.... 3
Houghton, E. F. & Co.	"	Cosmoline, for Medical Purposes....15

Houghton, E. F. & Co.	Philadelphia.	Cosmo-Lubric Oil.....29-16
Hover, Joseph E.	"	Writing Inks..... 4
Howard, R. L. & Son	Buffalo.	6 inch Schlinker Bolt Cutter.....29-6
Howe Machine Co.	Philadelphia.	Sewing Machines.....29-9
Howell & Bros.	"	Paper Hangings.....32
Howell & Burke,	"	Paper Hangings.....32
Huie, Chas.	"	Horse Shoes.....19
Hunt, C. M	"	Auto. Railway and Coal Elevator.....29-4
Hunter, Thomas	"	Chromos.....16
Hurst, John C. & Sons	"	Burdict's Polish Blacking.....15
Hutchins & Mabbett,	"	3-ply Veneer and Revolving Chairs..... 6
Iander, A. J.	Philadelphia.	Embroidery.....25
Independent S. M. Co.	Binghampton.	Sewing Machines.....29-9
Irons, Jas.	Philadelphia.	Convex Show Cases..... 6
Jacobs, S. W. & Son	Philadelphia.	Carriages..... 9
Janentzky & Co.	"	Water and Tube Oil Colors.....16
Jeffords, J. E. & Co.	"	Birmingham and Lava Ware..... 8
Jenkins, W. H.	"	Steam Trap.....29-2
Jenkins & Lee,	"	Marine Governor, etc..... 29-2
Jenks, A. S.	"	Pat. Driving Bits.....35
Johnston, Edwin S.	"	Window Shades, etc..... 6
Jones, Alonzo L.	"	Steam Trap, etc.....29-2
Jones, Harry	"	Model of Grant's Cabin.....21
Jones, J. Thos.	"	"Eureka" Anato. S. M. Treadle.....29-9
Jones, Wm. E.	"	Dress Shirts.....17
Justice, L. B.	"	Ice Cream Freezer.....22
Keasbey, Mattison & Rutter,	Philad'a.	Effervescent Preparations.....15
Keebler, Godfrey	"	Cakes and Crackers..... 2
Keller, Jno. P.	"	Graduated Quart Measure.....19
Kellogg, C. H.	"	Wrought Iron Columns.....24
Kelly, Howell & Ludwig,	"	Vertical Engines.....29-2
Kerr, James K. & Bro.	"	China and Glassware..... 8
Kerr, Norman M. & Co.	"	Paper Boxes..... 4
Keyser, Mrs. E.	"	Children's Clothing.....25
Keystone Gas Co.	"	Gas Machine.....29-15
Keystone Portable Forge Co.	"	Portable Forge and Blowers.....29 6
Kiehner & Odenatt,	"	Valve Seat Planing Machine.....29-6
Kilburn & Gates.	"	Cottage Chamber Furniture..... 6
Kimes, J. B. & Co.	"	Slate Mantels and Slate Work.....28
Klauder, J. C.	"	Prepared Mush..... 2
Klein, Chas. C.	"	Eccentric Piston Engine.....29-2
Knell, George	"	Sofa Bed, Reclining Chair, etc..... 6
Knickerbocker Ice Co.	"	Ice Tools.....19
Knight, Reeve L. & Son	"	Carpetings..... 7
Knowles' Steam Pump Co.	"	Steam Pump.....29-5
Knox & Shain,	"	Galvanometer.....33
Kolbe, D. W.	"	Surgical Instr and Artificial Limbs.....14
Kohler, Ig.	"	Book Binding 4
Kolb, G. F.	"	Fancy Cases.....40
Koningmacher, A.	"	Millstones.....28
Kramer & Co.	"	Pat. Lounge..... 6
Kreider, Zendgraft & Co.	"	Grain and Paint Mills.....29-13
Kretchman, E. A.	"	Model of Public Buildings.....16
Krider, J.	"	Guns and Fishing Tackle..... 3
Krumbhaar, Alex.	"	Files.....19
Kurlbaum & Co.	"	Chemicals.....15
Laeman & Son,	"	Doll Bodies.....22
Ladies' Depository,	"	Articles of Needlework.....25
Lagomarsino & Cuneo,	"	Macaroni, Vermicelli, etc..... 2

Lambertville Iron Works,	New Jersey,	Eclipse Boiler.....29-1
Langenheim, F.	Philadelphia,	Magic Lantern Slides.....16
Lautenbach, A.	"	Fretwork..... 6
Lattimer, D. J.	"	Planing Machine Duster.....29-7
Lauderbach, James W.	"	Wood Engravings.....16
Lawrence, F.	"	Pat. Tuyere and Cupola.....39
" "	"	Revolving Brackets.....22
Leak, Jno. F.	"	Mounted Show Case..... 6
Leedom, Shaw & Stuart,	"	Ingrain Carpets..... 7
Lehigh Valley Emery Wheel Co.	Weissport, Pa.	Emery Wheels, etc 29-6
Lehman, B.	Bethlehem, Pa.	Brass Work.....29-16
Leibrandt & McDowell Stove Co	Phila.	Stoves, Heaters and Ranges.....39
Lengett, George & Son,	Philadelphia.	Express and Truck Wagons..... 9
LeVan, W. Howard,	"	Grate Bars and Fire Regulators.....29-2
Levick, Richard, Son & Co.	"	Rubber Goods.....23
Libe & Haines,	"	Neats' Foot Oil Boot Polish..... 5
Lidgerwood Mfg. Co.	New York,	Reversible Hoisting Engine.....29-4
Linderman, B. & Co.	Philadelphia,	Ladies' Underwear.....25
Linfoot, B.	"	Water Color Drawing.....16
Lipman Manufacturing Co.	"	Patent Eyelet Machine..... 4
" " "	"	Hover's Carbonized Paper..... 4
Lippincott, Chas. & Co.	"	Soda Water Apparatus.....15
Lippincott, J. B. & Co.	"	Books, Book Binding and Printing..... 4
Little, Benj. R.	"	Fine Dress Shirts.....17
Lloyd, Supplee & Walton,	"	Bonney's Pat. Hollow Auger, etc.....19
Longacre & Co.	"	Wood Engravings and Machine.....16
Lovegrove & Co.	"	Atlas Steam Pump.....29-5
" "	"	Vertical and Horizontal Engines.....29-2
" "	"	Engineers' Supplies.....29-16
Lowe, A. & Co.	"	Mirrors..... 6
Lucas, John & Co.	"	Paints and Colors.....31
" " "	"	Painters' and Builders' Scaffold.....21
Lynch, Anthony,	"	Single and Double Harness.....35
Lynde, J. D.	"	Steam Engine Governor, etc.....29-2

Machette, Jr., E. V.	Philadelphia,	Self-raising Flour and Buckwheat..... 2
Magee, J. A.	"	Cut Glass..... 8
Malin Bros.	"	Pig Iron.....24
Mallory, Wheeler & Co.	"	Padlocks, Rim and Mortise Locks.....19
Mann, William	"	Blank Books and Copying Paper..... 4
Marey, L J.	"	Scioptieon.....33
Marshall, Bro. & Co.	"	Galvanized Iron Roofing Sheets.....24
Marter & Co.	"	Ladies' and Misses' Garments.....25
Martin L. & Co.	"	Lamp Black.....31
Mason & Co.	"	Engraving and Fine Stationery.....16
Mason, Jno. L.	Camden, N. J.	Tire Shrinker, etc.....29-6
Massey, Jas.	Philadelphia,	Electric Metallic Piston.....29-2
McAllister, W. T.	"	Philosophical Apparatus.....33
McArthur, Wm. & Co.	"	Feather Renovator, etc.....29-8
McBride, Thomas	"	Hydraulic Car Brake 29-4
McCaffrey & Bro.	"	Files and Rasps.....19
McChesney, Reuben	"	Fancy Arm Scroll Saw.....29-7
McConn, Jno.	"	Steam Radiator.....39
" "	"	Non-explosive Steam Coffee Pot.....22
McCormick, Jas.	"	Burglar Alarm.....19
McCoy & Roberts,	"	Cooking Ranges and Furnaces..... 39
McCracken, Samuel	"	Star Centre Table..... 6
McIlvaine & Bros.	"	Drug and Spice Powdering.....15
" "	"	Foundry Facings..... 39
McKeone, Van Haagen & Co.	"	Soaps.....38

McKeeson & Robbins,	New York,	Pharmaceutical Preparations.....15
McKinley, Jno.	Philadelphia.	Par'or Furniture..... 6
McKnight, A. C.	"	Water Repellant Leather.....27
" "	"	Water Repellant Boots and Shoes..... 5
" "	"	Am. Cable Screw Machine.....29-9
McLean & Benner Mach. Co.	"	Sewing Machines 29-9
McLear & Kendall,	"	Carriages..... 9
McNeil, Irving & Rich,	"	Water-proof building Paper.....21
McSorely, M.	"	Model Steam Fire Engine.....29-2
McCutcheon, John F.	"	Patent Eccentric Hook... 29-2
Megarge, Chas. & Co.	"	Ledger Writing Paper..... 4
Mehr, Geo.	"	Patent Sun Dial.....33
Mellor & Rittenhouse,	"	Printers' Rollers and Composition.....34
" "	"	Chemical and Phar. Manufactures.....15
Mellick, Peter B.	"	Terra Cotta Ware.....21
Mellor & Oram,	"	Wood Working Machinery.....29-7
Menamin, Robt. S.	"	Litho. Prep. and Printers' Chases, etc..34
" "	"	Heston's Label Cutter.....29-11
Mershon, Daniel, Sons,	"	Russian Heaters, & Portable Heaters...39
Mervine, S. H. Jr.	"	Gas Regulator.....29-15
Metcalf, Edwin,	"	Pen Picture 16
Metz, Geo. W. & Sons,	"	Brushes.....11
Middleton, N.	"	Plumbing Work on Ranges.....12
Middleton, J. W.	"	Temperature Regulator.....39
Midvale Steel Works,	"	Steel, Steel Tires, etc.....24
Miles, Jacob F. & Co.	"	Keystone Injectors.....29-5
Miller, A. G.	"	Paper Hangings.....32
Miller, Barr & Parkin,	"	Cast Steel.....24
Miller, H. W.	"	Steam Boiler Felting.....29-16
Miller, Joseph P.	"	Castings for Brick Kilns.....29-13
Miller, Samuel P. & Son,	"	Brick Press... 29-14
Miller & Krips,	"	Brass Castings.....12
Mills, Thomas & Bros.	"	Confectioners' Tools.....29-13
Mills, Thomas & Bros.	"	Engine and Ice Cream Freezer Comb d..22
Miner & Bannister,	"	Roofing.....21
Mitchell, J. E.	"	Grindstones, Fr. Burr Millstones, etc..28
Mitchell, J. Henry	"	Iron Boxes and Grindstone Fixtures...29-6
Mohler, Richard	"	Fourdrinier Wire Cloth.....29-11
Moorhead Clay Works,	"	Terra Cotta Ware.....21
Moore & Mixsell,	"	Scales.....36
Moore, William B.	"	Corset and Shoe Lacings 25
Moorhouse, Rockfeller & Co.	"	Lubricating Oils.....29-16
Morris & Haines,	"	Heaters and Rangers.....39
Morris Henry G.	"	Centrifugals for Sugar.....29-13
Morris Henry G.	"	Details of Gas Apparatus 29-15
Morton, Thomas	"	Sash Chains, etc.....19
Moseley & Metzgar,	"	Ætna Grate.....29-1
Mott, S. D.	Milford, Pa.	Adjustment for Sleds..... 9
Mundell, John & Co.	Philadelphia.	Machine for Sewing on Boot Soles.....29-9
Mundell, John & Co.	"	Anchor Button Fastener..... 5
Murphy & Broom,	"	Brass Bird Cages and Birds.....12
Murphy's, Wm. F., Sons,	"	Blank Books 4
Musgrove, Thomas & Co.	"	Patent Paper Boxes..... 4
Myers, Harry M.	"	California Wines 2
Myers, George	"	Bath and Range Boiler.....39
Nagle, Cook & Ewing.	"	Paper Hangings.....32
National Tube Co.	Boston.	Injectors 29-5
Naylor, Jacob	Philadelphia.	Steam Engines and Bal. Slide Valves...29-2
Naylor Jacob	"	Piston for Steam Cylinder. 29-2
Neafie & Levy,	"	Engine and Propeller.....29-2

Newell, Robert & Sons,	Philadelphia.	Photos. of Mdze., Country Seats, etc....16
New England Glass Company		Glassware..... 8
New York Sand Blast Company,		Glass Pictures by Sandblast.....16
Newkumet, A,	Philadelphia.	Keystone Stove Polish.....39
Newkumet, A.	"	Crucible Machines.....29-6
Nichols, Pickering & Co.	"	Spiral and Volute Springs.....29-4
Nichols, Reuben	"	Nonpareil Organ.....30
Nieman, Miss A. T.	"	Vase of Wax Fruit.....16
Nock, George W.	"	Padlocks.....19
Norris Iron Company,	Norristown.	Steam Boiler.....29-1
Norris Iron Company	"	Steam Engine.....29-2
Northampton Emery Wheel Co., Mass.		Emery Wheels and Machines.....29-6
Oakford, William H.	Philadelphia.	Hats.....20
O'Hara, Charles M.	"	Comfortable Chair..... 6
Oil Painted Wall Paper Manufac'g Co.	Bethlehem, Pa.	Wall Papers, Frescoes, etc.....32
Oldenburg, C. W.	Philadelphia	Shirts.....17
Omensetter, R. L.	"	Car Ventilator.....29-4
O'Neill, R. J.	"	Hose Couplings.....29-16
Opdyke & Anderson,	Clayton, N. J.	Improved Window Frames.....21
Orum & Miller,	Philadelphia.	Gas Bracket Match Safes.....22
Osgood, James R. & Co.	Boston, Mass.	Heliotypes, in Frames and Portfolios...16
Outerbridge, A. E.	Philadelphia.	Adjustable Rotary Stand.....33
Packer & Bates,	"	Oval Cutting Machine.....29-6
Packer, Charles W.	"	Ice Cream Freezers.....22
Parham, Charles	"	Machine Screws.....29-6
Partrick, Burnell & Co.	"	Telegraph Apparatus.....33
Parker, Chas. W.	Meriden, Conn.	Bench Vises.....19
Pattee & Perkins,	Philadelphia.	Fire Hydrants.....29-5
Patterson, Thos. B.	"	Adams Pat. Hand Truck.....19
Peacock, H. H.	"	Jewelry Cases.....40
Penn Coal & Ice Co.	"	Ice Tools.....19
Penn'a Salt Manuf. Co.	"	Chemical Products.....15
Penn'a Comb. Iron & Steel Ass.	"	Comb. Iron and Steel.....24
Penn'a Gas Coal Co.	"	Gas Coal.....10
Peterson, A. H.	"	Patent Window Sash.....21
Phila. Arch. Iron Co.	"	Architectural Iron Work.....21
" " "	"	Hayes' Pat. Sky Light.....21
Phila. Axle Works,	"	Carriage and Wagon Axles..... 9
Phila. Fire Extinguisher Co.	"	H. & L. Truck, and Extinguisher.....29-13
Phila. Galvanizing Co.	"	Galvanized Iron.....24
Phila. Hydraulic Works,	"	Steam Pumps, Samples Cast Steel, etc..29-5
Phila. Smelting Co.	"	Babbitt Metal.....29-16
" "	"	Brass and Bronze Castings.....12
Phila. Tool Co.	"	Pat. Duplex Wrench.....19
Phillips, E. F.	Providence, R. I.	Pat. Covered Tel. Wire.....33
Phillips, Wm. J.	Philadelphia.	Tel. Instrument, and Fire Alarm.....33
Phillips, S. R.	"	Harness.....35
Photo-relief Printing Co.	"	Stereoscopic Pictures.....16
Pierce, I. Newton	"	Pierce's Pat. Folding School Desk.....37
Pierce, M. P.	"	Portable Engine and Boiler.....29-2
Pile, Wm. H.	"	Hydrometers, etc.....33
Pilkington, Mrs. A.	"	Wax Flowers, etc.....16
Pilling, Geo. P.	"	Masonic, O. F. Jewels, etc.....16
" "	"	Surgical Instruments.....14
Place, John A.	"	Crushed White Wheat..... 2
Pohl & Rosenstein,	"	Galvanized Iron Pillar.....24
Poole, J. Morton & Co.,	Wilmington, Del.	Machine Calender.....29-11
Porter & Coates,	Philadelphia.	Books and Book Binding..... 4
Porous Water Proofing Co.	"	Water Repellant Boots and Shoes.... 5

Porous Water Proofing Co.	Philadelphia.	Specimens of Process	15
Potsdamer & Co.	"	Lithographic Work	16
Potter & Hoffman.	"	Rubber Belting and Hose	23
" "	"	Steam Engine	29-2
" "	"	Machinists' Supplies	29-16
Potter, John E. & Co.	"	Complete Bible Encyclopedia, etc	4
Potter, Thos. Sons & Co.,	"	Oil Cloths	7
" " "	"	Knapp's Pat. Spring Shade Roller	6
Power, Edw. W.	"	Pat. Crib Cradle	6
Power, Tainter & Co.	"	Planing and Flooring Machines	29-7
Powers & Weightman,	"	Chemicals	15
Prestien & Berwind,	"	Pianos	30
Pugh, Job T.	"	Augers, etc	19
Pusey, Jones & Co.	Wilmington, Del.	Paper Machinery, etc	29-11
" " "	"	Expanding Pulleys and Wire Guide	29-3
" " "	"	Rag Cutter	29-8
Pyott, L. J.	Philadelphia.	Brake Beam	29-4
Queen, Jas. W. & Co.	Philadelphia.	Math. Philos. and Optical Instr's	33
Quig, J. Travis & Co.	"	Pat. Marezzo Marble	21
Quint, S. H & Sons,	"	Metallic Signs	34
Rand, A. W.	Philadelphia.	Victor Gas Machine	29-15
Rankin, Andrew	"	Bronzed and Chased Work	19
Rapp, A. L. & Son,	"	Veneers	6
Rawlins Metallic Paint Co.	Wyoming.	Metallic Paint	31
Reading Hardware Co.	Philadelphia.	Japanned Dark Bronze Work, etc	19
Reeves, Miss M.	"	Millinery	25
Register, S. B.	"	Parlor Furniture	6
Reimer, B. F.	"	Picture Frames and Looking Glasses	6
" "	"	Photographs in Oil	16
Remmey, Richard C.	"	Chemical and other Stone Ware	8
" "	"	Fire Brick Tile and Stone Tile	21
Repetti, Joseph	"	Wax Figures	16
Rex & Boekius,	"	Printing Press	34
" "	"	Sewing Machines	29-9
" "	"	Gas Generator	29-15
Reyburn, Hunter & Co.	"	Lightning Rods	33
Reynolds, J. & Sons,	"	Furnaces and Ranges	39
Rhoads, W. G.	"	Windmill	29-2
" "	"	Pumps	29-5
Rice, D. E.	"	Monitor and Eliptic Sewing Machines	29-9
Rice, J. D.	"	Lightning Rods	33
Richie, E. L.	"	Bilge and Force Pump	29-5
Richards, Geo.	"	Twist Drill Grinding Machine	29-6
Richards, London & Kelly,	"	Wood Working Machinery	29-7
Richards & Pike.	"	Barr's Eliptic Steam Trap	29-2
Richards, Samuel	"	Butter and Lard Cutter and Gauge	22
Ridgway & Oliphant,	"	Gloves and Gauntlets	17
Riehle Brothers,	"	Scales and Testing Machines	36
Rogers, Thos. M.	"	Ink Drawings	16
Rogers, Wm. D. & Co.	"	Carriages	9
Rohlman, B.	"	Sideboard	6
Roots, P. H. & T. M.	"	Rotary Blower and Forges	29-6
Rorer, Thos. J.	"	Improved Union Belting	29 3
Rorer, J.	Lancaster.	Refrigerator	22
Rose Wm. & Bros.	Philadelphia.	Trowels, and Saddlers' Knives, etc	19
Rose & Neill,	"	Roller Composition	34
Rosengarten & Sons,	"	Chemicals	15
Rosewig & Stoll,	"	Pianos	30
Roth, Dr. Theo.	"	Artificial Eyes	33

Rowe, Geo. A.	Philadelphia.	Cameo and Intaglio Cuttings, etc.....16
Rowland, W. & H.	"	Eliptic Springs.....29-4
Rowley & Chew,	"	Wood Block Printing.....34
Royal & Read,	"	Ladies' and Misses' Shoes..... 5
Rue Manufacturing Co.	"	Little Giant Injector.....29-5
Rumpp, Chas.	"	Fancy Leather Goods.....40
Rumpp, C. F.	"	Fancy Leather Goods.....40
Russell & Erwin Man. Co.	"	Builders' Bronze Hardware.....19
Ruoff, Wm.	"	Jack Screw.....19
Russell, Thos.	"	Clarke's Spool Cotton.....13
Saehse, F. & Son	"	Fine Dress Shirts.....17
Saller & Lewin,	"	Machine Made Boots and Shoes..... 5
Sanguinetti, Mrs. E.	"	Specimens Atlantic Cable.....33
Sartain, Samuel	"	Engravings on Steel.....16
Savournin, W. H.	"	Toilet Powders and Rouge.....38
Scharm, Jno. P.	"	Copper Kettle.....12
Scheible, William F.	"	Flags, Awnings, etc.....21
Schmidt, Edw.	"	Steam Gauges.....29-16
Schmitt, Mad. K.	"	Hair Jewelry.....18
Schoenhut, Albert	"	Metallic Toy Piano, etc.....30
Schofield, Peter	"	Gauge Cocks.....29-16
Schomaker Piano Man'g Co.	"	Grand, Upright and Square Pianos.....30
School of Design for Women,	"	Drawings.....16
Scholl, William G.	"	Boots and Shoes..... 5
Schopp, Philip J.	Louisville, Ky.	Pneumatic Screen Ventilator 39
Schultz, B.	Philadelphia.	Clocks.....33
Scofield, Chas.	"	Device for Straightening Shafting.....29-6
Searfoss, Amos H.	Newark, N. J.	Vertical Portable Grinding Mill.....29-13
Seefeldt, William	Philadelphia.	Musical Instruments.....30
Seeler, W. W.	"	Plain Porcelain Pictures.....16
Seeley, J. B.	"	Trusses and Bandages.....14
Sellers Brothers,	"	Wire Goods and Dandy Rolls.....29-11
"	"	Bridge Railing.....29-4
"	"	Leather Belting.....29-3
Sellers, Wm. & Co.	"	Injectors.....29-5
" "	"	Machine Tools.....29-6
Seymour, Jas. M.	"	Sash Dovetailing Machine.....29-7
Shank, Thomas M.	"	Water Meter.....29-5
Shannon, J. B.	"	Revolving Sample Board of Hardware..19
" "	"	Electric Mag. Annunciator.....33
Sharpless, J. M. & Co.	"	Dye Stuffs, etc.....15
Sharpless & Watts,	"	Tiles.....21
Shaw Thomas	"	Test Gauges.....29-16
" "	"	Propellor Pump.....29-5
Shearman, Isaac H.	"	Johnson's Lathe Chuck.....29-6
" "	"	Steam Safety Boiler, etc.....29-1
Shedaker & Lindsay,	"	Miniature Shirt Factory.....17
Shepherd & Lloyd,	"	Tubular Iron Wheelbarrow.....29-16
Sherwood, Amanda S.	"	Fountain Griddle Greaser.....22
Shill, Harry J.	"	Children's Carriages..... 9
Shillingford, Jas. T.	"	Shingles, Pickets and Laths..... 2
Shipley, A. B. & Co.	"	Fishing Tackle and Sundries.....19
Shipley, Howard W.	"	Pocket Cutlery.....19
Shive Governor Co.	Bethlehem.	Steam Engine Governor.....29-2
" "	"	Buoy's Counter Scales.....36
" "	"	Watchman's Time Detector.....33
Shoch & Kimball,	Philadelphia.	Stoves, etc.....39
" "	"	Carbon Block Filters and Coolers.....12
Shoemaker, M. & Co.	"	Children's Clothing.....25
Shoyer, G. & Co.	"	Specimens of Taxidermy.....20
Shriver, T. & Co.	New York.	Copying Presses..... 4

Simes, Wm. F.	Philadelphia.	Compressed Camphor....15
Singer, Jacob	Harrisburg.	Improved R. R. Brake Shoe....29-4
Singer & Mentz,	Philadelphia.	Auto. Car Coupler....29-4
Singer Manufacturing Co.	"	Sewing Machines....29 9
Slocomb, W. H. & S. A.	"	Mince Meat.... 2
" " "	"	Fruit Cleaner and Meat Cutter....29-13
Smith, C. R. & Sons,	"	Cases to contain Watches....40
Smith, Wm M.	"	Device for driving Sewing Machine....29-3
Smith, J. L.	"	Map Case with Maps....37
Smith, Charles H.	"	Baxter Steam Engines....29-2
Smith R. D. O.	Washington, D. C.	Odorless Water Closet, etc....12
Smith, Oberlin & Bro.	Philadelphia.	Can Makers' Presses and Dies....29-6
Snyder, Henry & Co.	"	Shapley Steam Engine....29-2
" " "	"	Engineers' Supplies....29-16
" " "	"	Ames' Engine Lathe....29-6
Snyder, Theo. A.	"	Asbestos Board and Felting....29-16
Solomon, B.	"	Cartoons....16
Spaulding, E.	Boston.	Hemlock Sole Leather.... 5
Spellier, Louis H.	Doylestown.	Clock and Attachments....33
Stambach, J.	Philadelphia.	Ladies' Furs....20
Standbridge Bros.	"	Chapel Organ....30
Steam Generator M'f'g Co.	"	Sectional Steam Boiler....29-1
Steel, Robert	"	Fancy Written Show Cards....16
Steinmetz, Adam	"	Mantels and Monuments....28
Stevens Patent Vise Co.	N. Y.	Vises....19
Stevenson, Thos. R. & Co.	Philad'a.	Furnaces, Ranges, etc....39
Stewart, Jas. S.	Philadelphia.	Cylinder Lubricators....29-16
Stewart, David	"	Cracker Machine....29-13
Stewart, Marks, Ralph & Co.	"	Packing and Weighing Machines....36
Stileman, R. T. H.	"	Fire Plugs, Stop Cocks, etc....29-5
Stokes & Parrish,	"	Vertical Steam Engine....29-2
" "	"	Elevator Engine....29-4
Stokes, S.	"	Photographs....16
Straub, A. W.	"	Hand Turbine....14
Strow, Wile & Co.	"	Black Lead Crucibles....3 9
" " "	"	Sunnyside Stove Polish....39
Struthers & Sons,	"	Carving on Marble....16
Stuart, Peterson & Co.	"	Enameled and Tinned Hollow Ware....19
Suddards & Fennimore,	"	Photographs....16
Sumner, Geo.	"	Steam Regulator Valve....29-16
Susquehanna Iron Co.	Columbia.	Merchant Bar Iron....24
Sykes, L. & Son,	Philadelphia.	Improvement in Nut Locks, etc....19
Taber, Harbet & Co.	Philadelphia.	Oils....29-16
Tage, Charles	"	Ladies' Dress Elevator....25
Tarr, Henry S. & Son,	"	Excelsior Dry Level....19
Tatham & Brittin,	New York.	Safety Catch for Elevator....29-4
Tatham & Bros.	Philadelphia.	Magnetic Iron Ore....10
Taylor, C. R. & Co.	New York.	Toilet Soaps and Perfumery....38
Taylor, N. & G. Co.	Philadelphia.	Tin Plate....19
" "	"	Decorated Tin Plate....12
Taylor & Smith,	"	Color Printing, Lithographing, etc....34
Teal, Chas. Albert	"	Hair Picking and Cleaning Machine....29-8
The Panite Co.	Stroudsburg, Pa.	Emery Wheels, Milling Machine, etc....29-6
Thiery, Adolph	Philadelphia.	Looking-Glasses....6
Thomas, A. W.	"	Lotta Bustle and Bosom Form....25
Thomas, W. H.	"	Steam Safes....36
Thompson, David,	Newark, N. J.	Carbons for Galvanic Battery....33
Thompson, E. O.	Philadelphia.	Pantaloons and other Garments....17
Thompson, F. H.	"	Model of Sectional Boiler....29-1
Thompson & Harper,	"	Slate Mantels....21
Thorne, DeHaven & Co.	"	Machinists' Tools....29-6

Tiel, George	Philadelphia.	Child's Sleigh..... 9
Tillotson, L. G.	New York.	Telegraph Instruments.....33
Times Printing House,	Philadelphia.	Specimens of Printing.....34
Torrey, Mrs. M. A.	"	Marking with Indelible Ink.....16
Trainor, D & Sons	Delaware Co.	Ticking and Shirting Stripes.....13
Trask & Bacon,	Philadelphia.	Photographs.....16
Travis, J. L.	"	Water Closet and Plumbers' Supplies...12
Tripler. A. B.	"	Railroad Crossties.....29-5
Troemner, H.	"	Coffee Mills..... 2
"	"	Scales.....36
Trump Bros,	Wilmington, Del.	Fleetwood Scroll Saw.....29-7
Tully, John W.	Philadelphia.	Patent Paint Filler.....29-16
Tupper, L. B.	"	Grate Bars.....29-1
Tygh, James F.	"	Tobacco Stripping and Book'g Machine.29-6
"	"	Self-Pressing Cigar Shield.....29-3
Union Iron Company,	"	Beams 60 and 50 feet long.....24
Upham, Samuel C.	"	Florida Waters and Perfumery 38
VanHaagen C. & Co.	"	Machine Tools.....29-6
Verree, John P.	"	Hardware.....19
Vickery, John	"	Patent Toilet Glasses.....6
Vogelbach, H. A.	"	American Perfumery.....38
Wagner, William	"	Two Amethystine Formations.....10
Wale, George & Co.	"	Testing Machine and College Lantern...33
Walker Bros.,	Minnesota.	Scroll Saw.....29-7
Walker Bros.& Co.	Philadelphia.	Farm Mill.....29-13
Walker, David R.	"	Fire Alarm Telegraph Apparatus.....33
Walker, M. & Sons	"	Wrought Iron Railings and Wire Work.21
Wallace & Keller,	"	Canes.....17
Walter, Geo. C.	"	Wet Skin Sewing Machine.....29-9
Walter & Stoelt,	"	Show Cases..... 6
Walters, Thomas F.	"	Pillow Frame..... 6
Walters, W. P.'s Sons	"	Mechanics' Tools.....19
Wanamaker & Brown,	"	Clothing.....17
Ward & Co.	"	Rough Plate Window Glass..... 8
Warne, Mahlon	"	Car Advertiser.....29-4
Warner, Wm. R. & Co.	"	Sugar Coated Pills.....15
Washburn & Moen M'f'g Co.	New York.	Wire.....19
Washington Mills,	Lawrence, Mass.	Worsted Coatings, Shawls, Dress G'ds..13
Waters Pat. Heater Co.	Conn.	Feed-Water Heater 29-1
Watson, Andrew	Philadelphia.	Steam Engine Governor 29-2
"	"	Upright Steam Engine.....29-2
Watt & Kennedy,	"	Traveling Bags and Trunks.....35
Wattis, Edw. Jr.	"	Pocket Flasks.....18
Weaver & Lyle,	"	No-Top Wagon..... 9
Weaver & Pennock,	"	Marble and Walnut Plumbing Fixtures.12
Weed Sewing Machine Co.	"	Sewing Machines.....29-9
Weicke, Edward	"	Steam Boiler.....29-1
Wells & Hope Co.	"	Patent Advertising Signs.....16
Weimer & Berkenbine,	"	Shell Coil Tuyeres..... 29-16
West, Joseph J.	"	Braiding and Embroider'g Attachm't...29-9
Western Union Tel. Co.	"	Telegraphic Instruments.....33
Weston, Byron	Dalton, Mass.	Linen Ledger and Record Paper..... 4
Wetherill, Robert	Chester, Pa.	Steam Cylinder Lubricators.....29-16
" "	"	Piston.....29-2
" "	"	Corliss Engine.....29-2
Wetherill Bros.	Philadelphia.	White and Red Lead, etc.....31
Wharton R.R. Switch Co.	Philadelphia.	R.R. Safety Switch and Steel R.R. Frog.29-4
Wharton, Wm. Jr.	"	Steel Curves for Street Railway.....29-4
" "	"	Turntable for Street Railway.....29-4
" "	"	Rail Curving Machine.....29-4
Wharton, Joseph	Camden, N. J.	Ores and Products of Nickel, etc.....15

Wheeler & Wilson M'f'g Co.	Bridgeport, Conn.	Sewing Machines....29-9
" " "	"	Sewing Machine Work....25
Whitall, Tatum & Co.	Philadelphia.	Glassware.... 8
White, C. A.	"	Dental Material.... 14
White, S. S.	"	Dental Instruments and Material....14
"	"	Dental Engine....14
White & Samson.	"	Cutlery....19
Wickersham & Bro.	"	Patent Iron Fence.... 1
" "	"	Oil Cups and Feeders....29-16
Wilbraham, T. & Bro.	"	Engine and Pressure Blowers....29-6
Wiler, William	"	Stair Rods, Step Plates etc....22
Wilhelm, August	"	Ceiling Reflectors....26
Wilhelm & Neuman,	"	Street, Hall, and Hotel Lamps....26
Williams, B. J.	"	Venetian Blinds.... 7
Williams, Charles	"	Slate Mantels....28
" "	"	Hot Air Furnaces....39
Williams, Chas. B. & Sons	"	Sole Leather....27
Williams & Gaugher,	"	Ligno-Rubber Mat, etc.... 7
Wills, Edwin,	"	Spoon-Pointed Wood Screws 19
Wilson Sewing Machine Co.	"	Sewing Machines....29-9
Wilson, Theo. & Co.	"	Cakes and Crackers.... 2
Wilson, Childs & Co.	"	Cast Iron Hubbed Wheels.... 9
Wilson & Fenimore,	"	Paper Hangings 32
Wilson & Miller,	"	Slate Mantels....28
Wilson, William L.	"	Terra Cotta Ware....21
Wilson, William M.	"	Florida Water....38
Wilson (Shuttle) S.M.Co.	Cleveland, O.	Sewing Machines....29-9
Wilson, T. A. & Co.	Reading.	Arundel Tinted Spectacles 33
Wilson, Wood & Co.	Philadelphia.	Water Cooler....22
Winner & Co.	"	Rotary Color and Brush Stand....16
Wirts, Wm.	"	Patent Tire Shrinker, etc....29-6
Wistar, Frank	"	Steam Radiator....39
Womrath, F. K.	"	Ladies' Furs....20
Wood, Alan & Co.	"	Planished Sheet Iron.... 24
Wood & Haslam,	"	Quilts and Bed Clothes....13
Wood, David	"	Ladies' and Infants' Clothing....25
Wood & Light Mach. Co.	Worcester.	No. 1 Bolt Cutter....29-6
Wood, R. D. & Co.	Philadelphia.	Fire Hydrant and Stop Valve....29-5
Wood, Thomas	"	Power Looms....29-8
Woodward, Garret & Co.	"	Tobacco 2
Woodruff Geo. J.	Norristown.	Model of R. R. Switch....29-4
Woolley, G. W.	Philadelphia.	Fountain Pen.... 4
Worrell Bank Lock Co.	"	Bank Lock....36
Wright, James C.	Berks Co., Pa	Cast Iron Chimney Top....29-1
Wright, Mrs. Joshua	Philadelphia.	Mince Meat.... 2
Wright & Smith,	"	Variable Speed Shafting.... 29-3
Wrigley, W.	"	Mineral Scouring Soap.... 38
Wurflein, William	"	Parlor Rifle.... 3
Wyeth, John & Bro.	"	Compressed Pills, etc....15
Wynne, Mrs. M. E. B.	New York.	Fancy Stitching on Shoes....25
Yale Lock Co.	Stamford, Conn.	Locks, and Bronze Hardware....19
Young, A. K. & Conant Mfg. Co.	Boston	Gossamer Water Proof Clothing....23
Young & McCully,	Philadelphia.	Masonic Jewels, etc....18
Young, W. J. & Sons,	"	Surveying Instruments....33
Zell, T. Elwood	Philadelphia.	Books of Reference.... 4
Zentmayer, Joseph	"	Microscopic Apparatus....33
Ziegler & Smith,	"	Painted and Stained Glass.... 21

NOTE.—The figures on right of page in the foregoing Catalogue of Exhibitors, are the numbers of the Classes to which the articles belong.

INSTRUCTIONS TO JUDGES.

October 26th, 1874.

In the selection of Judges, the Board of Managers have aimed to secure the services of persons well informed on the objects entrusted to them for examination. Each one of you who has so kindly accepted the task, on entering upon your duties, will please bear in mind that it has ever been the aim of this Society, in every way in its power, to increase the intrinsic value of its premiums by good judgment in awarding them.

On application at the office, your Chairman will be supplied with paper upon which to write his report. This will bear a heading "Hall of Exhibition Franklin Institute, etc." For the sake of uniformity he will please use this paper only, and write on but one side of each sheet. Address it to Mr. Wm. P. Tatham, Chairman of Committee on Exhibitions, by whom it will be referred to the proper authorities.

It is expected that your report will be of value as a contribution to the history of the state of the arts in America. If approved by the Board of Managers, it will be published over your signatures. You will receive the credit of your work with the indorsement of the Institute.

The competing objects must be of American manufacture only. The awards must be for superior merit; not alone that it is the best of the kind exhibited, but you must consider its merits in reference to what you know to exist in the market of American production. If but one object of a kind is in competition, judge of its claim on its merits, and recommend such award as you think it deserves; if not worthy, withhold recommendation. Make honorable mention of all the good qualities of such articles as may not be considered entitled to a special premium. Point out defects in production or construction; any such information as you underline will be considered as confidential, and not published, but will go towards showing how you have arrived at your conclusions. We beg your careful attention to page 10, Rules and Regulations, also pages 13 to 16 inclusive, which are binding.

You will please bear in mind that you are not expected to make awards of premiums, but simply to *recommend awards.* The awards must be made by the proper authorities of the Institute, their judgment being aided by and based upon your report. You will please report on such objects as you may deem worthy which are not entered for competition.

Trusting you will hand in your report at as early a day as possible,

Respectfully,

By order of the Board,

COLEMAN SELLERS, *President.*

REPORTS OF JUDGES.

The recommendations of awards made by the Judges, and addressed to the Board of Managers, have been omitted from the reports, and the awards as made by the Board, are printed in Italics; as is all other language not used by the Judges.

CLASS No. 1.—AGRICULTURAL IMPLEMENTS.

The undersigned Committee on Agricultural Implements, appointed for the purpose of investigating and deciding on the merits of Machines on Exhibition, respectfully report:

That they have carefully examined each article presented, and have formed their conclusions from the best available means, not having the advantage of actual trial necessary to a full understanding of their practical application, we recommend only to an award of merit, such as present evidences of utility and novelty, or are of superior excellence for the purpose for which they are made.

---

94. WILLIAM L. BOYER & BRO. Burt's Union Railway Power. This machine possesses many marked points of superiority over ordinary tread power; the power is applied at the top and bottom

of the driving gear, the weight and power of the horse acting directly to propel the machine with great force, it requires only a slight elevation of the horse, making it easier for him to travel, and with less strain and injury to him, thus economizing in animal wear, while the peculiar construction of the gear reduces the friction below the ordinary amount. *Bronze medal.*

94. Same Depositors. Wood's Mowing Machine. This is a machine of acknowledged merit.

254. B. GILL & SON, Trenton, N.J. Rye Thresher. The peculiarity of this Machine is its threshing out the grain without breaking the straw. On account of the growing commercial value of rye straw, any Machine effecting the purpose is a great desideratum. This Machine appears well adapted to that object.

Certificate of Honorable mention.

LAWN MOWERS.—The introduction of these little, but useful implements has superseded the unwieldy scythe and given encouragement to all persons for the culture of neat, well trimmed lawns, which contribute so much to their beauty at a trifling cost of skill and labor. Three different mechanisms have been exhibited:

1091. S. A. HAND. The Reliance Lawn Mower. This Machine is constructed of two flat circular plates, each cut out to give the form of cycles or cutting blades, the upper one having four knives, and revolving upon the lower one, which has ten knives. Motion is given by a very neat and delicate gearing, which admits, by a changing process of the propulsion of the machine in either direction; it is, however, of doubtful practical utility.

645. J. BELLANGE COX. The Continental Lawn Mower. This is an adaptation of the old Field Mower for lawn purpose, intended to cut grass of any height; the principle may be ultimately acquired, but some improvement in the general construction of this machine will be necessary to fully accomplish the object.

353. GRAHAM, EMLEN & PASSMORE. The Philadelphia Lawn Mower. Several different sizes and varieties of this machine are on exhibition, of varying lengths of cut, from 14 to 30 inches; the small

sizes for hand use, and the largest for horse, technically called "Pony Mowers," with shafts and with driver's seat, or without, as preferred. These Mowers are perfect in their construction and seem to be the *ne plus ultra* of Lawn Mowers. *Silver medal.*

981. S. L. Allen & Co. The Planet Drill and Wheel Hoe. This is one of the most ingenious garden implements exhibited; its inventor, Mr. Allen, is a practical gardener and agriculturist, and seems to have quite intelligently understood every necessary detail of its working and to have fully met it, combining the various purposes of a seed drill, and weeding, ploughing and cultivating hoer. *Silver medal.*

706. John M. Hess. Hanging Baskets. There is a large and varied assortment of these very beautiful adjuncts of a Window Garden, in the shape of ornamental hanging baskets, fern cases, aquariums, etc., with an arrangement by which they are constituted self-watering for many days. *Certificate of Honorable mention.*

1163. H. & B. S. Beam. Patentee, J. H. Shreiner. Broadcast Seed Sower. This is an appendage to the ordinary seed drill, by which the grain, after passing through the gum tube and drilling hole, falls upon a bell-shaped casting, thus causing the seed to scatter, instead of falling in a heap as it is liable to do, constituting a "Broadcast Sower." *Not entered for Competition.*

J. W. Lippincott,
E. Potts,
S. C. Harbert.
Committee.

CLASS No. 2.—Agricultural Productions.

The Committee on Agricultural Productions, Class 2, entered upon their duties, and gave daily examinations of various goods on exhibition, until they came to their unanimous conclusion as follows:

20. Duryea Glen Cove Starch Company. Satin Gloss Starch. *Silver medal.*

522. Same Depositors. Improved Corn Starch. *Silver medal.*

60. E. V. Machetie & Co. Self-Raising Flour. An ingenious and convenient article, but as we are not informed of the ingredients, cannot give any recommendation of its true value.

78. Lagomarsino & Cuneo. Macaroni, Vermicelli and Fancy Paste, This branch of production has become of great interest to our City, as only a few years ago nearly all used was imported. The cooking properties not tested; but they make a very beautiful display of their goods, and the quality, doubtless, the best of American manufacture. *Bronze medal.*

209. Mrs. Joshua Wright. Mince Meat. This is of very superior quality. *Bronze medal.*

277. S. Fuguet & Sons. Key West Havana Cigars. A very handsome display. *Bronze medal.*

270. Atmore & Sons. Mince Meat. Plum Puddings. The Plum Puddings are the first put up in this country in sealed cans; are very good. *Certificate of Honorable mention.*

416. D. Carrick & Co. Crackers, Cakes and Biscuit. *Bronze medal.*

664. T. Wilson & Co. Crackers, Cakes, etc. *Bronze medal.*

740. Godfrey Keebler. Cakes and Crackers. *Bronze medal.*

The display in this department is very handsome, and evinced great progress, both in variety and quality, and each of the manufacturers' goods were so nearly alike, that we suggest that the highest award be made to each.

489. C. J. Fell & Brother. Spices and Mustard. The display of the product in its natural state was perfect, and so far as we can judge, the ground article was good, but as it is susceptible of adulteration, it is difficult to determine. We believe that the preparation of Mustard in this country has not attained the perfection it ought. *Silver medal.*

669. E. M. Dexter. Ornamental Confectionery. A very fine display. *Bronze medal.*

916. Woodward, Garrett & Co. Manufactured Tobacco. This is the finest Tobacco manufactured. *Bronze medal.*

1103. C. J. Fell & Brother. Self-Raising Flour.

1203. E. V. Machette, Jr. Self-Raising Buckwheat.

1309. John A. Place. Crushed White Wheat. This article is entering largely into use as food for dyspeptics, etc. It is considered one of the best articles of the kind.

Certificate of Honorable mention.

1341. Henry M. Meyers. California Champagne.

1454. Frishmuth, Brother & Co. Fine Cut Tobacco. As good as any made. *Bronze medal.*

237. G. Boyd, Philadelphia. Aroma Coffee Cooler.

Bronze medal.

238. Same Depositor. Aroma Coffee Roaster. *Bronze medal.*

The Committee do not think themselves competent to judge of the machinery.

993. E. Mockridge & Co. Azumea, etc. Has long been known as a reliable article.

1079. Black & Brother. Cooked Meats.

1492. H. Troemner. Coffee Mill. *Bronze medal.*

980. Lagomarsino & Cuneo. Farina.

Certificate of Honorable mention.

1313. W. H. & S. A. Slocomb. Mince Meat.

1421. J. C. Klauder. Improved Prepared Mush.

All of which is respectfully submitted.

L. Knowles,
E. Bradford Clarke,
James R. Webb.
Thomas R. Patton,
Charles W. Ketler.
E. J. Crippen.

Committee.

CLASS No. 3.—Arms and Military Good .

The exhibitors in the Class of Arms and Military Goods are Messrs. Horstmann, Bros. & Co., Wm. Wurflein and Jno. Krider.

622. Horstmann Bros. & Co. Military Goods. With respect to the articles manufactured by these parties, I find the goods of Horstmann Bros. & Co. sustain their well merited and long tried reputation for durability and superiority of workmanship.

Not entered for competition.

951. Wm. Wurflein. Creedmore or Parlor Rifle. The Creedmore or Parlor Rifle of Mr. Wurflein contains some new and meritorious features, as in the combination by which a single "carrier" is made to answer for both cap and cartridge, "inserted in the under side of the barrel in the breech end of the inside barrel." The patentee claims also that it requires no powder and uses three kinds of cartridges, and is available for long or short ranges. The rifle has been tested, and is giving entire satisfaction to parties using it. *Bronze medal.*

1019. John Krider. Fowling Pieces. These present no new features, but sustain the well merited reputation of his establishment, and exhibit the excellence of his work.

Certificate of Honorable mention.

Lewis M. Haupt.
Committee.

CLASS No. 4.—Books and Stationery.

The undersigned Judges appointed to examine articles under Class No. 4, respectfully report:

39. Joseph E. Hover & Co. Writing Inks and Chemical Writing Fluids. A very ample display of these articles, embracing an indestructible ink of special interest upon important documents.

Silver Medal.

699. W. F. Murphy's Sons. Blank Books and Copying Books. An admirable collection, all of approved quality and workmanship. Also, Pens and Pencils in great variety, and other Stationery. The

collection is an admirable one, and reflects great credit upon the skill and business energy of the firm. For blank and copying books.

Silver medal.

264. Lipman Manufacturing Co. Hover's Carbonized Writing Paper. *Certificate of Honorable mention.*

265. Lipman Manufacturing Company. Eyelet Machine. An improved Eyelet Machine for fastening sheets.

Certificate of Honorable mention.

331. Crane Bros. Ledger Paper of different sizes. Also, four circular Baskets, one clothes Trunk, one piece of broad Belting, one Horse Collar, and one Wagon Box, all made from "Paper Pulp."

Bronze medal.

John E. Potter & Co. present three distinct items for examination:

941. Brown's Self Interpreting Bible.

Certificate of Honorable mention.

942. Potter's Complete Bible Encyclopædia. *Bronze medal.*

943. Blackwood's Comprehensive Bible.

Certificate of Honorable mention.

403. T. Elwood Zell. Zell's Encyclopædia. This work is evidently beyond the scope prescribed for the criticisms of the Institute. Its mechanical features are well adapted to its noble purpose of extended usefulness; but its true standing is on its literary merits, which should be committed to the reviewers and competent journalists. Valuable books of reference.

Certificate of Honorable mention.

455. I. Kohler. Bookbinding. An imposing assortment of valuable books, in costly binding, and done almost exclusively by tool work, exhibiting elaborate ornamentation in connection with substantial work. *Bronze medal.*

464. Wm. Mann. Blank Books. A fine display, and of excellent quality.

1493. Wm. Mann. Copying Paper. Exceptionally good quality. *Silver medal.*

644. Esterbrook & Co. Steel Pens. A large assortment of Steel Pens of American manufacture. *Bronze medal.*

686. Porter & Coates. Books. A beautiful and valuable collection of Books of their own publication in all departments of literature. The printing and binding of great elegance of design and workmanship.

1234. Porter & Coates. Binding. *Bronze medal.*

742. J. B. Lippincott & Co. Blank Books and General Binding. This display presents a large variety of superior Blank Books, faultless in style, execution, and materials; valuable Library Books in the finest bindings; and very superior specimens of letter press Printing, all under two entries. The whole display is so emphatically worthy that we ask for it any additional acknowledgement allowable under the circumstances. *Silver medal.*

1512. J. B. Lippincott & Co. For Printing. *Bronze medal.*

743. Byron Weston. Ledger and Record Paper. Presents specimens of very superior Ledger and Record Paper, certainly the best article within our view. *Silver medal.*

803. Fry's Engraving Office. Engraved Ornaments, Tools, and Dies, for Bookbinders. The specimens evince superior taste in the patterns, and skill in the execution. *Bronze medal.*

819. A. J. Holman & Co. Bibles and Photograph Albums. A large assortment, profusely ornamented. *Certificate of Honorable mention.*

861. C. Magarge & Co. Writing Paper. Fair specimens of Writing Paper from Messrs. Jessup & Laflin, Westfield, Mass. *Certificate of Honorable mention.*

1003. G. W. Woolley, M. D. Reservoir Pen. For his invention of a superior Reservoir Pen in various styles of material. *Bronze medal.*

1354. L. Dreka. Stationery. Offers a Dictionary Blotter, neatly prepared, and a most tasteful assortment of Envelopes, Circulars, etc. *Certificate of Honorable mention.*

44. Altemus & Co. Photograph Albums. Very superior Photograph Albums, in great variety. An improved mode of forming the back of the volume by metallic rods deserves special note.
Bronze medal.

A. Hart.
Hector Orr.
E. R. Cope.
Committee.

CLASS No. 5.—Boots and Shoes.

Your Committee of Judges appointed to examine exhibits of Class 5, beg leave to report as follows:

2. Thos. R. Evans. American Gaiter. An invention, being a Shoe and Gaiter combined, making a neat looking and comfortable wearing shoe. The material in quality and selection good. On invention, *Bronze medal.*

207. Wm. F. Bartlett. Gents' Hand-Made Turn Boots and Shoes. Consider his styles, material and workmanship good.
Certificate of Honorable mention.

308. C. Benkert & Son. Gents' Hand-Made Boots and Shoes. Material, workmanship, style and finish, and in all respects, superior. *Silver medal.*

1497. Porous Waterproofing Co., T. B. Potts, Pres. Waterproof Turn Hand-Made Boots and Shoes and Material. The treatment, as an invention, we consider worthy of credit. The workmanship, style and finish for hand turn work, very good.
Certificate of Honorable mention.

461. John Mundell & Co. Anchor Button Fastener. Cannot recommend it as any improvement whatever.

543. Thos. R. Evans. Revolving Boot and Shoe Tree. A good and useful invention for treeing, stretching and lengthening Boots and Shoes. *Not entered for competition.*

936. Wm. G. Sholl. Hand-Made Seamless Boots and Shoes. Style and workmanship ordinary, material good.
Certificate of Honorable mention.

983. Saller, Lewin & Co. Machine-Made Gents' Shoes and Gaiters. Material, style and workmanship first-class for throughout machine-made Shoes. *Bronze medal.*

1236. Allen, Gates & Bro. Ladies' Machine-Sewed Turns Boots and Shoes. Style, finish and material very good for machine-sewed turns. *Certificate of Honorable mention.*

184. M. A. Erskine & Co. Ladies' Hand-Made Boots and Shoes. Material, style and workmanship first-class. *Bronze medal.*

1021. Royal & Reed. Ladies', Misses' and Children's Machine-Sewed Boots and Shoes. The workmanship, material, style and finish first-class. *Bronze medal.*

1484. A. C. McKnight. Water-Repellant Boots and Shoes. The waterproof treatment, as an invention, we consider worthy of credit. The material, style and workmanship, for screw wire fasten bottoms, good. *Certificate of Honorable mention.*

John J. Ziegler,
Charles G. Scott,
John P. Thompson.
Committee.

CLASS No. 6.—Cabinet Ware and Upholstery.

The Committee appointed to examine the articles of the above Class, consisting of Mirrors, Frames, Cabinet Ware, Upholstery, etc., respectfully submit the following report:

61. Samuel McCracken. Centre Table, composed of 34,800 pieces. For ingenuity and beautiful finish.
Bronze medal.

63. C. W. Clark. Window Shades, Shade Cloth and Fixtures. Very good.

410. Hale, Kilburn & Co. Patent Flexible Wood-Seat Chair. *Bronze medal.*

411. Hale, Kilburn & Co. E. E. Everett's Patent Folding Bedstead. *Silver medal.*

412. Hale, Kilburn & Co. H. W. Curtis' Patent Walnut Mats for Mirrors and Picture Frames. *Certificate of Honorable Mention.*

413. Hale, Kilburn & Co. Walnut, Looking Glass and Picture Frames. *Certificate of Honorable mention.*

201. Edward S. Johnson. Window Shades, Balance Spring Roller Attachment, manufactured by the Salem Shade Roller Manufacturing Co. Improvement in Roller. *Certificate of Honorable mention.*

208. Jas. S. Earle & Sons. Mirrors, Picture Frames, etc. For superior workmanhip. *Silver medal.*

336. Frederick Boland. Mirrors, Picture Frames, etc. For fine finish. *Bronze medal.*

219. J. W. Cooper & Bro. Fancy Walnut Brackets, etc. For assortment, style and finish. *Silver medal.*

252. J. A. Bancroft & Co. Improved Reversible Settee. Thos. J. Close, Patentee. *Bronze medal.*

521. R. W. P. Goff. Fancy Walnut Brackets, etc. *Bronze medal.*

311. Chas. W. O'Harra. Comfortable Chair. *Bronze medal.*

415. A. Lowe & Co. Mirrors, Picture Frames, etc. Good work and finish. *Bronze medal.*

470. Brainerd, Armstrong & Co. Spool Silk Cabinet. Very good and convenient.

524. Allen Bros. Parlor Furniture, etc. For extra finish and style. *Silver medal.*

825. W. McArthur. Patent Improved Bottom for Bedstead. Mentioned for facility in taking down and putting up.

745. Hutchins & Mabbett. Gardner's Patent 3-ply Veneer Chairs, Settee, Car Seats, Chair Seats, Tilting Chair, Counter, and Desk Stool. For 3-ply Veneer Chair, *Bronze medal.*

149. C. Faser. Gilt Mirror Frames. For fine finish. *Certificate of Honorable mention.*

723. James Irons. Convex Show Case. Good work, very handsome.

926. E. W. Power. Patent Crib Cradle. Horizontal motion.

42. Wm. Gatznousky. Hair Spring Mattress.

1059. John W. Boughton. Adjustable Window Screen.

837. F. D. Kramer. Spring Bed Folding Lounge.

1318. Edward Dietz. Centennial Sofa Bedstead. Mentioned for convenience.

175. Carrington, DeZouche & Co. Curtains in Parlor. Handsome display. *Certificate of Honorable mention.*

378. H. W. Collender, N. Y. Billiard Table.

1352. Thos. Potter, Sons & Co. Knapp's Spring Balance Roller. Very good, possessing superior qualities. *Bronze medal.*

794. A. Thiery. Mirror and Frame. Workmanship good.

1280. W. B. Hazzard. Reversible Skylight Shade.

188. W. Heacock. Furniture. Fine finish and good display. *Certificate of Honorable mention.*

414. Kilburn & Gates. Cottage Furniture. *Bronze medal.*

549. H. B. Coyle. Centennial Iron Bedstead. *Bronze medal.*

3. Wm. B. Coates. Convertible Folding Lounge.
Bronze medal.

125. Walter & Stoeltz. Show Case.
Certificate of Honorable mention.

433. G. J. & J. H. Henkels. Chamber Furniture. Fine design and finish. *Certificate of Honorable mention.*

689. John McKinley. Parlor Furniture.
Certificate of Honorable mention.

638. S. B. Register. Suit of Furniture.
Certificate of Honorable mention.

755. John Vickery. Patent Toilet Glass. Very good.

1022. B. Rohlman. Sideboard.

1400. Thos. F. Walter. Skeleton Pillow Frame.

1435. Jas. Irons. Plate Glass Convex Top Show Case.
Certificate of Honorable mention.

879. Cyrus Horne. Burial Casket. *Bronze medal.*

Joshua Cowpland,
H. Lejambre,
John Harvey,
Geo. J. Young,
Thos. Birch,
Committee.

CLASS No. 7.—Carpets and Oil Cloths.

The Committee, appointed to examine and report upon Carpets and Oil Cloths, would respectfully say:

That they met for the purpose of their appointment, and examined carefully and impartially the goods, and would award as follows.

1257. R. L. KNIGHT & SONS. For exhibit of Alexander Smith & Son's Moquette or Axminster Carpets. The sample exhibited, as compared with the French article, being equal in color, etc.

Silver medal.

59. REEVE L. KNIGHT & SONS. For exhibits of the Lowell Mfg. Co.'s Body Brussels; and Jno. and Jas. Dobson's Body Brussels, which show the great improvement they have made in the manufacture; and John Gay's Ingrain Carpets, of the best quality of stock and superior colors, as exhibited in samples.

Silver medal.

1105. BROMLY BROTHERS. Hall and Stair Damask Imperial Carpets. *Silver medal.*

516. G. W. CHIPMAN & Co. Samples of Carpet Linings and Stair Coverings. These are well known articles, and sold by all carpet dealers. *Certificate of Honorable mention.*

709. JOHN BROMLY & SONS. Ingrain and Damask Carpets.

Bronze medal.

400. THOMAS POTTER, SON & Co. Table and Enameled Cloths. Entitled to commendation for the exhibition of handsomely gotten up styles of Floor Cloths. Their enameled goods are the best made in this country. *Silver medal.*

THOMAS FINLEY,
P. E. MCKENNA,
FRANCIS F. MILNE,
Committee.

CLASS No. 8.—PORCELAIN, EARTHENWARE AND GLASSWARE.

The recent increase, in this country, of certain branches of the Ceramic Arts, notably that of ordinary opaque and porous bodied earthenware, gave hopes of a larger and more interesting exhibition than it is now the duty of the Committee to make report upon. Of the branch named, ordinary earthenware, there are no specimens exhibited, if the showing of Messrs. J. E. Jeffords & Co, of Philadelphia, manufacturers of brown rockingham and yellow wares, be excepted.

174. Messrs. Jeffords & Co. Yellow Rockingham, Birmingham and Yellow wares. The "body" or "metal" of these is of a very sound and durable character, and very well represents the present state of the manufacture in this country. It may be said that the present product of the coarser wares in the United States equals the home demand, and has nearly displaced the foreign-made wares. *Certificate of Honorable mention.*

120. Richard C. Remmey. Gray Stoneware applied to Household Utensils, Chemical Apparatus, etc. This is the only exhibit of this useful ware, although there are many manufacturers through the United States. The Committee can perceive no improvement in this branch, either in "body" or in shapes, but find that Mr. Remmey's is quite equal to the best of the kind made in America. The "body" of this manufacture is hard and enduring.

Certificate of Honorable mention.

Before leaving this branch, which has grown to be an important one, in amount of production, in the United States, the Committee desire especially to call attention to the general want of application of well known rules of art in the drawing of the forms of ordinary domestic utensils. The demand of the American market requires, undoubtedly, strength and utility of construction, but the steady growth of the Public in knowledge of art, will as undoubtedly, give a great success to those manufacturers who will add simple grace and beauty to those lower, primary demands. Although there still exist in this country some manufacturers of certain branches of Porcelain, no examples of their wares are in this Exhibition. Many efforts have been made to establish the manufacture of porcelain in the United States, but hitherto nearly always with loss to the manufacturer. This, probably, arose from the prematurity of the efforts, although all the materials used in this manufacture are in abundance in the vicinity of Philadelphia and elsewhere in the United States, and are of as good quality and as cheap, relatively, as in any country in Europe. It may be stated that porcelain formerly made in this city, and elsewhere in this country, was found to equal in all respects, in quality of "metal" or "body," that made in any country of Europe. That is, in strength, in capacity to bear extreme and sudden changes of temperature, in hardness, in translucency, in vitreousness, in qualities for glazing, in clearness of ring, denoting a

well-combined and hard body, in beauty of color and in clear and clean reception of colors used for decoration—the "body" of the American porcelain has been made quite equal to that of any foreign make. It is, therefore, to be especially regretted that the manufacture of this most beautiful product of the plastic arts has not been pecuniarily successful with us, and that no further exertions are making to re-establish it. Perhaps, if the efforts made in this direction could have been subjected to and guided by the present more advanced knowledge and taste, a permanent success might have been achieved in this important, useful, and beautiful art.

Within the last ten or fifteen years the *decoration of porcelain* and *earthenware* has considerably increased in this country, where there can now be reproduced the most of the imported decorations. No great advance, however, has in that time been made in the quality or originality of design in decoration. Indeed, nearly all of the designs or patterns employed in the United States are direct copies from French, English, or German porcelains. In this, as in all other arts, the present advanced taste demands originality of design as well as nicety or beauty of drawing and color.

224. J. K. Kerr & Bros. Decorated China. In this branch there is but this one exhibit. They present several show cases of very good specimens, and credit is due to them for the mode of display of their samples. The decorations are clean and fine, uniform in tint and in groundlaying, and are creditable to the exhibitors and to the Exhibition. *Bronze medal.*

GLASSWARE.

900. New England Glass Co. S. G. Boughton, Agent. Beautiful specimens of glass, cut, pressed, and plain. Some table sets exhibited by them are of very brilliant metal. The patterns or designs are well drawn, and show to advantage the brilliancy of the glass. The display of colored and enameled glass made by this company is excellent. *Bronze medal.*

490. The Boston and Sandwich Glass Co. J. K. Dunham, Agent, has a large and valuable showing of varied kinds of wares. It presents a number of good specimens of etched as well as engraved glass, and a number of lamp shades decorated on bone glass. Their "flint" (lead) glass, both in plain and cut, and in "pressed" forms, is very good. *Bronze medal.*

398. J. K. KERR & BROTHERS. Show some beautiful specimens of glass engraving of various designs and well executed. Their lathe and engraving wheel in operation, form one of the attractions of the Exhibition. *Certificate of Honorable mention.*

595. WHITALL, TATUM & Co., of Philadelphia, present a large number of very good specimens of Druggists and Chemists' Glass-wares, Bottles, etc., both in white and colored glass, and samples of white and green glass fruit jars, vials, etc. *Bronze medal.*

213. WILLIAM HOLZER, of Philadelphia, has a case of very well made Medical, Chemical, and Philosophical Glass Apparatus, blown and formed by him. Mr. Holzer deserves credit for the great regularity with which his wares are made.

Certificate of Honorable mention.

661. HALE & MANLY. Ornamented Glass Bottles, Jars, and Plates. This appears to be an application of colored lithographs or paints under glass, and made to adhere thereto by means of some cement. These objects have a pretty and pleasing effect.

597. J. A. MAGEE. Engraving on Glass. Some very creditable pieces, both colored and white, for architectural purposes. Some of the designs are very good.

728. WARD & Co., Phila. Two very large plates of rough Glass for architectural purposes. These excellent examples were made by the Lennox Glass Co. The dimensions of these plates are 48 x 142 inches; one being one inch, the other half an inch in thickness. The "metal" of these plates is very good. The large and growing demand for this kind of plate glass in architecture gives importance to these two examples. It is pleasant to believe that this country can probably now satisfy this demand. *Silver medal.*

1128. JOHN L. MASON. Patent Fruit Jars, which are creditable.

1424. THE COHANSEY GLASS Co., New Jersey. F. L. BODINE, President. Green and Brown Glass Bottles, Fruit Jars, very large Cylinders, Flasks, Electrical Insulators, etc. The most of the jars are filled with fruits, and they seem to be successful in preserving their contents from the action of the air.

Certificate of Honorable mention.

1375. HARTELL & LETCHWORTH. Glass Plates and Lamp-Globes, eroded or engraved by Tilghman's Sand Blast. The Committee desire to call especial attention and remark to the value of this wholly original and ingenious invention as exemplified in the exquisite reproductions upon glass of first-class engravings, of lace work, and of other designs. The value of this invention, as applied to glass and other materials, is very great and deserves special mention. The Committee regret that no specimens of the eroded (sand blast) glass, in which the glass is cut entirely through, came under their notice. Hartell & Letchworth exhibit, also, some good specimens of cut glass, lamp-globes, etc.

Certificate of Honorable mention.

708. THE DEMPSEY WICKER-COVERED GLASSWARE CO., Philadelphia. The Demijohns, Bottles, and Flasks exhibited make a creditable appearance, and add variety of form and ornamentation to this class of glassware covered by wicker-work. *Bronze medal.*

1153. J. & G. H. GIBSON, Philadelphia. Three Stained and Painted Glass Windows. The whole effect of these is good, and they show a continued advance in this beautiful branch of applied art. The drawing of the figure of Michael, and of the two angels, made for memorial windows, is creditable, and the designs of the accessories are excellent. The coloring of these is rich and brilliant, and the colors are represented, and believed to be, as enduring as any upon the foreign made glass. The growing taste of the country will more and more enlarge the field on which the Messrs. Gibson have so successfully worked, and, as in the case of Pugin, of England, it may be hoped that our best artists will yet give some of their time and genius to the production of original work in beautiful stained glass. Messrs. Gibson exhibit, also, some fine examples of decorative signs on clear plate and on silvered glass.

Silver medal.

When glass making was first established in the United States, the English mode of manufacture and the English choice of materials were employed, so that nearly, if not quite all the product of the country was of lead glass. The French manufacturers prefer soda, and the Germans use potash as a flux, and each of these has some

peculiar advantages in the product. Lead glass has certainly great beauty and brilliancy because of its greater density, while the soda glass and the potash glass have greater toughness, strength, and tenuity, capable of being made into very thin and light forms, of receiving tints of color more readily, of bearing greater extremes of temperature, and of being, perhaps, of better texture for engraving. It is not known to the Committee that there are any manufacturers of fine table glass in this country using soda or potash, although large quantities of such glass is constantly imported. The manufacture of lime glass has been successfully introduced in the United States, at Pittsburg and elsewhere, but it is used only in the inferior and cheaper wares. There are no exhibitors of this sort of glass.

In conclusion, the Committee of Judges regret that the display made in this Exhibition, in nearly all the branches of Class No. 8, or what might be called a useful fine art, is of so very limited extent.

HARTMAN KUHN,
ALEX. WILCOCKS,
HECTOR TYNDALE,
S. DECATUR SMITH,
Committee.

CLASS No. 9.—CARRIAGES, WAGONS, ETC.

Your Committee appointed to examine all articles exhibited under Class No. 9, after having made a careful examination, beg leave to offer the following report:

1292. WM. D. ROGERS & Co. Glass front 5 light Landau.
1293. " " " Exeter phaeton.
1294. " " " Three-quarter Surrey wagon.
Silver medal.

277. WM. D. GARDNER. Carriages. *Bronze medal.*

519. SAM'L W. JACOBS & SON. Carriages.
Certificate of Honorable mention.

481. JAMES FLEMING. Two Carriages.
Certificate of Honorable mention.

527. WEAVER & LYLE. One No-top Wagon.
Certificate of Honorable mention.

164. GEO. K. CHILDS. One Man Wagon.
Certificate of Honorable mention.

262. MCLEAR & KENDALL. Carriages.
Certificate of Honorable mention.

334. COLLINGS BROS. Carriages.
Certificate of Honorable mention.

79. W. GARNER & SON. Light Business Wagon.
Silver medal.

43. FULTON, WALKER & Co. Omnibus. *Silver medal.*

431. FULTON, WALKER & Co. Express wagon. *Silver medal.*

301. GEORGE LENGERT & SON. Heavy Truck Wagon.
Silver medal.

235. HARRY J. SHILL. Children's Carriages. *Silver medal.*

87. S. P. CAMPBELL & Co. Children's Carriages.
Bronze medal.

715. BENEZET & Co. Coach, Carriage and Wagon Springs.
Silver medal.

909. W. & H. ROWLAND. Coach, Carriage and Wagon Springs.
Bronze medal.

882. GEORGE TIEL. Child's Sleigh.
Certificate of Honorable mention.

198. WM. BURWELL & BRO. Carriage Mountings.
Silver medal.

15. PHILADELPHIA AXLE WORKS. Carriage and Wagon Axles.
Certificate of Honorable mention.

1457. ADVENA & HEALD. Carriage and Wagon Axles.
Certificate of Honorable mention.

616. HOOPES' BROS. & DARLINGTON. Carriage and Wagon Wheels.
Certificate of Honorable mention.

1414. HOOPES' BROS. & DARLINGTON. Bent Carriage Material.
Certificate of Honorable mention.

1208. W. GARNER & SON. Hand Made Wheels.
Certificate of Honorable mention.

988. S. D. MOTT. Patent Guiding Attachment for Coasting Sleigh.
Certificate of Honorable mention.

The following articles were also entered for competition and examined by the Judges, viz.:

302. GEORGE LENGERT & SON. Business Wagon.

395. GEO. W. EADLINE. Sterick's new patent Metallic Hub Wheel with Diamond Lip Attachment.

1118. WM. T. FROHOCK. Steel Suspension and running Gears for Vehicles.

1167. WILSON, CHILDS & CO. Coal Cart, patent Wheels and one pair Cart Wheels.

WM. GARNER & SON. Milk Wagon and Larven's patent Wheels.

JOS. BECKHAUS.
JACOB LAUDENSLAGER.
THOMAS CARRICK.
D. M. LANE.
GEORGE W. HASKELL.
Committee.

CLASS No. 10.—Coals and Minerals.

Your Committee have examined carefully into the merits of the articles of entry under this Class, and especially of those entered for competition. The undersigned regret very much that the State of Pennsylvania, so very rich in mineral products, was not better represented at this exhibition, when indeed an extremely attractive representation might have been effected.

---

662. Pennsylvania Corundum Co. J. C. Hand. This Company deserves credit for the development of a new branch of industry in this State. The claims set forth in its circular are heartily endorsed by your Committee. The Corundum of Chester county, as exhibited, is fully equal to any other, and surpasses many localities in respect to quality. On account of the absence of Spinel, which occurs especially in the emerys of Asia Minor and India, it can be said that the consumer obtains much more grinding substance, pound for pound, in using the Pennsylvania Corundum Co.'s products than in buying from the above mentioned localities, and also from Chester, Mass. The samples of ground Corundum exhibited, from the coarse to the finest grain, tend to show that the Company is perfectly aware of the requirements of the arts using these products.

Silver medal.

1364. Denver and Rio Grande R. R. Co. Coal and Coke. This coal has to be classified as a dry bituminous coal, with 16·03 per cent. of ashes, and 54·12 coke, at a red heat for one-half an hour. The coke made from this coal is hard, and would stand the burthen in shaft furnace, but it yields 27·6 per cent. of ashes, which cannot be termed a favorable percentage.

Certificate of Honorable Mention.

360. S. D. Boyer. Clearfield Semi-Bituminous Coal. A very large block, without any special claims.

1429. Penn. Gas Coal Co. Several fine samples of Gas Coal, without special claims.

1471. W. Wagner. One-half of a silicious Geode. Showing the paragenetric formation of concentric layers of agate and chalcedony upon which, finally, fine crystals of quartz, variety amethyst, were deposited. The most remarkable is the final crystallization of a hollow column of quartz crystals, when the source of the silicious solution had become too poor to fill the whole cavity of the geode.

Very Respectfully Yours,

George H. Koenig,
Saml. P. Sadtler,
Chas. B. Dudley,
Committee.

CLASS No. 11.—Combs and Brushes.

928. Chas. Brintzinghoffer. Leather Back Horse Brush. This brush is particularly prized for its flexibility, lightness, and great durability. Mr. Brintzinghoffer was the first brush maker to draw and introduce this article of manufacture. *Silver medal.*

635. Geo. W. Metz & Sons. Full and complete line of Toilet and other Brushes. These articles are particularly distinguished for the neatness and excellence of their finish, good taste exhibited in their display, superior workmanship, and quality of material. *Bronze medal.*

F. A. Tilge,
S. Lloyd Wiegand,
James T. Shinn,
E. D. VanHorn,
John W. Nystrom,
Committee.

CLASS No. 12.

Your Judges of Class No. 12 respectfully report, that they have carefully examined the articles submitted to them for examination, and submit the following:

112. COOPER, JONES & CADBURY. Valve Water Closet. A very ingenious method for operating a water closet valve.

Bronze medal.

280. COOPER, JONES & CADBURY. Compression Bibs for Hot and Cold Water. We do not consider they have any special merit over other compression cocks in the market. *Bronze medal.*

124. R. D. O. SMITH, Washington, D. C. Odorless Water Closet and Urinal. We find nothing new in the appliance.

Certificate of Honorable mention.

232. WEAVER & PENNOCK, Philadelphia. Marble and Walnut Plumbing Fixtures. A very handsome display of bath tubs, wash stands, etc., showing some of the latest improvements that are being introduced into some of our first-class dwellings.

Not entered for competition.

204. CHAS. GEFRORER, Philadelphia. Gas Fitters' and Plumbers' Pumps. Well made articles. *Not entered for competition.*

559. J. L. TRAVIS. Bath Tub in working order and Combination Shower Stop. The combination shower stop is an ingenious arrangement for filling the bath tub with water. Hot, cold, or water of any temperature may be drawn as required, and by simply pressing a valve spindle the shower is put into operation.

Bronze medal.

560. J. L. TRAVIS. J. & H. Jones' Ne Plus Ultra Water Closet. Your Committee think the Ne Plus Ultra Closet the best and most reliable, and possessing merit. *Silver medal.*

561. J. L. TRAVIS, Philadelphia. Plumbers' Brass Work. A fine display of excellent brass work.

1249. JOHN P. SCHAUM. Copper Kettle. A superior piece of copper work. *Bronze medal.*

328. CHAS. BURNHAM & CO. Transportation Box Cans, etc. A very convenient article for conveying oils and other liquids.

1221. Chas. Burnham & Co. Patent Transportation Cans. Similar to 328, and each has their own peculiar advantages.

1222. Chas. Burnham & Co. Patent Safety Cans. These cans have a very convenient arrangement for filling them with oils and liquids, and pouring out their contents without liability to waste. The faucets are of peculiar construction, and well adapted to the purpose. There is considerable merit in this can.

Bronze medal.

1320. W. S. Bates. Patent Basin Cock for Hot and Cold Water. A new and very ingenious combination basin cock for drawing water into a wash basin at any temperature.

Bronze medal.

1070. Miller & Kripps, Philadelphia. Samples of Brass Castings. These are all made in Philadelphia sand, and we think they are the best specimens of fine castings we have ever seen.

Silver medal.

1480. Phila. Smelting Co. Unfinished Brass and Bronze Castings. Good material and fine workmanship. *Bronze medal.*

* 1101. N. & G. Taylor Co. Decorated Tin Plates.

Bronze medal.

* *This entry was omitted from list of competitors accidentally, and therefore failed to receive attention from the Judges.*

Henry H. Kelley,
Chas. Perkes,
John Fry,
Chas. M. Sandgran,
Committee.

CLASS No. 13.—Cotton and Woolen Goods.

The Committee on Cotton and Woolen Goods and Textile Fabrics would respectfully report that while they regretted the smallness of the display of this class of goods, they were highly pleased with the very superior qualities of many of the goods exhibited and which merit high awards.

1503. Washington Mills, Lawrence, Mass. Jas. W. Dayton, Philadelphia, Agent. The style worsted coatings being difficult patterns and finely finished, fast in color, and equal in all respects to any imported goods. *Silver medal.*

The other styles worsted coatings, also the serges, are commended. *Not entered for competition.*

The Cretonne dress goods made by the "Washington Mills," are beautiful goods, of good fabric, and notable for their fullness and richness of color. *Not entered for competition.*

1504. Washington Mills, Lawrence, Mass. James W. Dayton, Agent. The "Bay State" Reversible Shawls, made at these mills, are superior goods, being of good fabric, and the combinations shading and blending of the colors, are particularly worthy of attention. *Silver medal.*

1505. Burlington Woolen Co., Winooski Falls, Vt. Jas. W. Dayton, Agent. Kerseys. *Silver medal.*

1506. Burlington Woolen Co., Winooski Falls, Vt. Jas. W. Dayton, Agent. *Silver medal.*

The "6-4 Black Cloths, Doeskins," and the "Kerseys," we consider first quality for strength, beauty, permanency of color and fineness of fabric, and that they compare favorably with imported goods of the same grade. The piece No. 3095 being an excellent wool dyed blue goods which we have never seen surpassed for brilliancy of color.

1059. David S. Brown & Co. Gloucester & Ancona Printing Company. The display of prints deposited by this firm is good and worthy of a diploma. *Certificate of Honorable mention.*

103. Fiss, Banes, Erben & Co. Jennapped Worsted Yarn. *Silver medal.*

104. Fiss, Banes, Erben & Co. No. 120 Worsted Yarn. *Silver medal.*

Their display of Jennape, Coating, Worsted Yarns and Zephyrs are highly creditable to them and to the city of Philadelphia. The

uniformity of thread, regularity of twist and the superior quality of yarns, make them worthy of high premiums.

We would respectfully ask the attention of the Committee on Science and the Arts to the No. 120 Worsted Yarn, it being remarkable for quality and fineness, and far in advance of any yarn ever made in the United States on Throstles. It contains nearly 38 miles to each pound of yarn. We should be glad if you would consider it worthy of one of the higher medals of the Institute.

1120. J. Clarke, Jr. & Co. The display of Spool Cotton is very pretty.

651. Wood & Haslan. Their Quilts are good in quality and design. *Bronze medal.*

729. David Trainer & Sons, Linwood, Pa. Their super extra Omega Tickings are a very superior quality of tickings, being made of "double and twist" warp of first quality, and being remarkable for the closeness of fabric and the freedom from imperfections, and the blue and white yarns being very clear and distinct from each other. *Silver medal.*

1227. Colladay, Trout & Co. Willimantic Co's Spool Thread is a superior thread, being uniform in thickness and twist and measures full length marked on the spool. The strength of yarn on being tested averaging higher than a celebrated imported yarn. *Silver medal.*

85. S. B. & M. Fleisher. Their Star Alpaca Braids are uniform in quality, and equal to any domestic or imported goods. *Silver medal.*

We have tested the silk thread with the following results:

Belding, Bros. & Co.

O Black,	93.442	
C White,	113.451	
Black Sewing Silk,	99.509	
		306.402

AUB, HACKENBURG & Co.

O Black, ...	89.445
C White, ...	115.366
Black Sewing Silk, . . .	104 026
	308.837

Being a difference of 2.434² in favor of Aub, Hackenburg & Co. Their silks being uniform in thickness and twist, and with some elasticity, makes them particularly adapted for machine and sewing silks. We believe the manufacture of pure colored silks, which the above firm claim the honor of introducing, has largely driven the heavily weighted (by dye) imported silks from the American market.

16. AUB, HACKENBURG & Co. Machine and Sewing Silks, (Black and White.) *Silver medal.*

478. BELDING, BRO. & Co. S. C. HALL, JR. & Co., Agents. Their 100 and 50 yards Spool Silks, plain and fancy colors, are superior goods. *Silver medal.*

THOMAS FINLEY,
SAM'L R. MCDOWELL,
JAMES WHITAKER,
GEO. CALLAGHAN,
Committee.

CLASS No. 14.—DENTISTRY AND SURGICAL INSTRUMENTS.

The Committee of Judges appointed to consider and report upon the merits of the various articles placed upon competition by the exhibitors in Class 14, "Dentistry and Surgical Instruments," do hereby report as follows:

62. S. S. WHITE. Artificial Teeth. *Silver medal.*

547. JOHN GODFREY. Dr. Morton, inventor. Hospital Ward Dressing Carriage.

548. JOHN GODFREY. Dr. Morton, inventor. Hospital Bed Elevator.

556. Dr. Charles A. White. Dentistry. Artificial Teeth, Manipulating Celluloid Dental Plates (with apparatus).

596. J. B. Seeley. Trusses, Bandages, etc. For Trusses, *Bronze medal.*

785. J. B. Seeley. Silk Elastic Surgical Bandages. *Certificate of Honorable mention.*

601. B. C. Everett. Trusses, and other Surgical Bandages.

683. A. W. Straub. Hand Turbine for driving Dentists' Drills, Fans, etc.

1517. D. W. Kolbe. Surgical and Orthopædical Instruments, For Surgical Instruments, *Silver medal.*

779. D. W. Kolbe. Artificial Limbs. *Silver medal.*

787. J. A. Foster. Artificial Limbs.

903. Geo. P. Pilling. Surgical and Dental Instruments. *Certificate of Honorable mention.*

986. T. Wardell. Artificial Teeth.

1262. Forster & Stowell. Sphynx.

1359. M. A. Waas. Artificial Teeth.

1478. S. S. White. The S. S. White Dental Engine. It is deemed worthy of special note, as being an instrument, or engine fully capable of performing all that is promised for it, combining all the virtues of several other engines. *Silver medal.*

James E. Garretson, M. D.
J. H. McQuillen, M. D.
T. L. Buckingham,
John H. Packard, M. D.
Committee.

CLASS No. 15.—Drugs, Dye Stuffs, and Chemicals.

The Committee of Judges for Class No. 15 (Drugs, Dye Stuffs, and Chemicals) was, for convenience of working, sub-divided. Messrs. Maisch, Remington, Rand, Krause, and Fairthorne undertook the examination of all Drugs and Pharmaceutical Preparations, while Profs. Genth and Sadtler took charge of the examination of the pure Chemicals, and Prof. Konig and Mr. Carter of the technical Chemicals and manufactured products. The report will therefore be divided into two parts,—the report upon Chemical Preparations and Technical Products, and the report upon Drugs and Pharmaceutical Preparations.

I.—*Report upon Chemicals, Dye Stuffs, and Technical Products of Chemistry.*

Before proceeding to discuss the individual articles exhibited, the Committee would congratulate the Board of Managers upon the magnificent representation of the chemical manufactures of Philadelphia at the present Exhibition of the Franklin Institute.

Philadelphia is well known as the centre of the manufacturing-chemical industry of the country, and a fine display in this line was expected. However, we think that all expectations were surpassed by the beauty, variety, and fullness of the representation on the present occasion.

Scientific gentlemen from other cities, who have visited the present "Franklin Institute Exhibition," have, in the hearing of several of the Committee, expressed themselves in terms of unqualified admiration at the display, freely conceding its superiority to anything ever seen in this country before. The Committee, therefore, need hardly go into any explanation to the Board of Managers with regard to the number of recommendations for medals they have made.

The firms exhibiting are mostly known to the trade by their superiority in individual specialties of their manufacture, and thus it has happened that several exhibitors show on their lists articles considered individually as the best in the market.

The first exhibit which was brought before the Committee to pass judgment upon was that of the:—

520. Philadelphia Quartz Company. J. S. & T. Elkinton. These gentlemen exhibit a large number of samples of Silicate of

Soda, designed for various technical and domestic uses, together with washed machinery waste and soap manufactured from their Silicates, to which latter they call especial attention. They show by their display that they have advanced in this branch of technical chemistry to a high degree of perfection. Analysis shows the composition of their Silicates to be that represented by the best authorities as the most favorable one for its application to various purposes. Among these latter the Committee would mention particularly the use of it as a substitute for ordinary soap. The general public are under the impression that the admixture of Silicate of Soda in soap is an adulteration, tending to lessen the cleansing value. This view is erroneous. Soap is a combination of a fatty acid with alkali. Its cleansing property lies in its capability of assimilating a certain quantity of fatty matter, and in the formation of a lather which offers a large surface for the removal of the colored particles of matter—dirt. The Silicate of Soda having a like composition, being Silicic Acid and Sodium, has the very same properties. It can assimilate fatty matter, and besides the Silicic Acid particles which separate from the combination offer a material for gentle friction between the fibres, and this friction, without being injurious to the fibre, removes the coloring matter more rapidly than soap alone would. The Committee have taken this opportunity to correct prevalent erroneous opinions, and recommend the silicated soaps and washing silicates as a decided improvement both in work done and in saving effected.

Bronze medal.

84. Rosengarten & Sons. Chemicals. These gentlemen exhibit quite a list of chemicals, and claim for them superior purity considered as commercial articles. The Committee have carefully examined a number of them and find this claim fully substantiated, some of the articles being almost absolutely chemically pure, and being certainly the best of the kind in the market For purity of chemical preparations. *Silver medal.*

123. Powers & Weightman. Chemical and Medicinal Preparations. The display of this firm was certainly one of the features of the present Exhibition, being in many respects superior to anything

ever shown. In beauty of crystallization and general appearance their preparations are certainly worthy of great commendation.

In a communication referred to the Judges, Messrs. Powers & Weightman say:

"We desire also to call your attention to the following:

"We deposit specimens in quantity of *Citric Acid*, of which article we are the sole manufacturers in this country, and which we make on a large scale. This is a new branch of American industry, and is deserving of especial notice for the following reasons: it is largely employed in medicine and for other purposes, it is made extensively in England and on the continent of Europe, is used in quantity in this country, but until recently the supply has been derived exclusively from foreign sources. The following table shows the importance of this manufacture.

Imports of Citric Acid into the Port of New York.

In 1871,	902 Kegs,	say . . .	1 cwt. each.
	88 Casks,	" . . .	5 "
" 1872,	1019 Kegs,	" . . .	1 "
	60 Casks,	" . . .	5 "
" 1873,	853 Kegs,	" . . .	1 "
	No Casks.		

"Almost all that was consumed in this country in 1874, and quite a proportion of that used in 1873, was from our laboratory. For some time past (1872–74) we have been making efforts to induce parties in the southern section of the U. S. to concentrate the juice of the lemon and sour oranges of their localities, and have granted them every facility in our power to promote this industry.

"This has been done at a great outlay of capital, and our efforts in this direction have been energetic and made in the face of unusual discouragements. (Lemon or Lime juice is the crude material used for making Citric Acid). We have not been able to secure a supply in this country, but have been obliged to depend upon Sicily for the most of the Lime juice used in our operations. We are practically without protection from the government—the duty on Lemon juice (10 per cent.) being about equal to that on Citric Acid (10 cents per pound).

"We beg leave further to call your attention to the specimens exhibited of the cheap Alkaloids of Cinchona Bark. These were deposi-

ted in large quantities, and we are satisfied that they were of unquestionable purity. For very many years we have taken special pains and spent many thousands of dollars to introduce these valuable although cheap preparations, feeling more than ordinary satisfaction in being able to furnish large quantities of reliable anti-periodics to the poorer classes at very low figures. This display of the alkaloids, Cinchonidia, Quinidia, and Cinchonia (and the sulphates of the same), they claim to be equal in purity to any in the world, and they are furnished at prices that bear comparison with the rates current in Europe.

"Their value is well understood abroad, and the British government has considered them of such importance as to take measures to introduce them in their colonies. They are of such service in cases of malarial diseases, etc., that it is of material consequence to this country that they should be produced here in large quantities and at low prices.

"In this department our efforts have been uninterrupted for many years, and claim to have been largely instrumental (far more than any other manufacturers in the U. S.) in furnishing to the poorer classes in this country, and at moderate prices, a class of preparations deserving of more than casual notice. Especially do these remarks apply to the Sulphate of Cinchonidia, which is considered by many as equal in therapeutic properties to Sulphate of Quinia, and which is sold at about one-third the price. To this preparation we have given great attention, and taken unusual pains to make its value known during the past year.

"The U. S. Dispensatory, p. 311, states: "Sulphate of Quinia has *until recently* been used almost to the exclusion of the others (the other alkaloids), but Sulphate of Cinchonia is now considerably employed, and with nearly equal effect; and there is every reason to believe that the Sulphates of Quinidia and Cinchonidia will be found not less efficient."

"We extract from a recent publication the following: "In the year 1866, the Madras government appointed a Medical Commission to test the respective efficacy in the treatment of fever, of Quinine, Quinidine, Cinchonine, and Cinchonidine." Of the sulphates of these alkaloids a due supply, specially prepared under Mr. Howards' superintendence, was placed at the dispcsal of the Commission. From the report it appears that the number of cases of paroxysmal

malarious fevers treated was 2472,—namely, 846 with Quinine, 664 with Quinidine, 569 with Cinchonine, and 403 with Cinchonidine. Of these 2472 cases 2445 were cured and 27 failed. The difference in remedial value of the four alkaloids, as deduced from these experiments, may be thus stated :

Quinidine,	ratio of failure	per	1000	cases treated,	6
Quinine,	"	"	"	"	7
Cinchonidine,	"	"	"	"	10
Cinchonine,	"	"	"	"	23

"The Indian government, acting on the recommendation of Mr. Howards, has officiously advised (Dec. 16, 1873) the more free use in India of Cinchona alkaloids other than Quinine, and especially of Sulphate of Cinchonidine, which is procurable in abundance from Red Bark."—(Pharmacographia,—a History of Drugs, page 328).

"We have been assured that our display of the above alkaloids and their sulphates, namely, Quinidia, Cinchonidia, and Cinchonia, was the largest and finest ever exhibited either in this country or in Europe."

The display of products of Cinchona Bark and Citric Acid is referred to the Committee on Science and the Arts for award of the Elliott Cresson Gold Medal.

The Committee also examined carefully a number of the most important chemicals, and can testify to their general excellence and purity as commercial articles. For their fine display, general excellence and purity of their commercial preparations, *Silver medal.*

256. Henry Bower. Chemicals, comprising Yellow Prussiate of Potash, Oleic Acid, Stearic Acid, and Glycerine. This group of chemicals presented an exceedingly attractive appearance. It was made up, in part, of his Glycerine in various vials. This article has a very high reputation in the market. The committee submitted it to a variety of tests, and find it to be almost chemically pure Glycerine, and entirely free from all mineral impurities. For fine display and general excellence of Glycerine and other chemicals,

Bronze medal.

352. J. M. Sharpless & Co. Dye Woods, prepared Dye Stuffs, and Chemicals. For their extracts of Logwood they claim entire freedom from all adulteration, and that it will give a better color for quantity used than any other make. Also that their dye woods are

strictly pure and of the best quality. The Committee have made a careful series of tests, and find these claims substantiated. For purity of dye stuffs and dye woods, *Bronze medal.*

357. KURLBAUM & Co. Chemical Preparations, and Refined Camphor. The Committee made tests upon a number of the chemical preparations, and find that their fine appearance is backed by great purity. Many of these articles are special preparations differing from the other chemical lots exhibited. For purity and beauty of chemical preparations, *Bronze medal.*

361. PENNA. SALT Co. Large crystals of Alum, and a series of products obtained from Cryolite. They call attention to the variety of these products, and claim especial purity for their Bicarbonate of Soda. The Committee have carefully examined this and find that the Bicarbonate of Soda made at Natrona by this Company from Cryolite is the purest commercial article ever produced in any country. A careful analysis shows the presence of other compounds only to such an amount as chemists are accustomed to allow in chemically pure substances. Inasmuch as the Bicarbonate of Soda has become an article of domestic use as an anti-dyspeptic drug, and as a constituent of the baking powders, the purity of this article has become of a high sanitary importance. For fine display and for purity of their Sodium Bicarbonate, *Silver medal.*

483. POROUS WATER-PROOFING Co., Pennsylvania. Cloth, Leather, etc., treated by the process of this Company. This Company claim that the cloth, leather, etc., treated by their process is rendered practically waterproof, without injuring the material in the least, and in the case of the leather with marked improvement to it. The Committee has tested these claims carefully, and are not prepared to give its assent to them. While the end to be attained is a desirable one, and therefore the Company are to be encouraged in their efforts, they do not seem as yet to have attained success.

808. WM. GULAGER. Glycerine, manufactured by Hartman, Laist & Co., Cincinnati, Ohio. For this Glycerine is claimed superior purity, density, and freedom from odor. The Committee find it quite free from mineral impurities, of full specific gravity, and

odorless. They find, however, that it leaves a slight bitter taste, and that it is colored slightly brown on mixing with strong pure sulphuric acid. They consider it a good commercial glycerine. For its excellent qualities mentioned,

Certificate of Honorable mention.

1213. HARRISON, BROS. & Co. Oil of Vitriol. For this is claimed that it is pure mono-hydrated acid, that it stands full 66° by Beaume's Hydrometer, that it is free from Aqua Fortis and all other impurities, and is the best acid offered to the trade for commercial purposes. The Committee have made the requisite tests, and find that these claims are justified. For excellence of Oil of Vitriol,

Certificate of Honorable mention.

1332. WM. GULAGER. White Wax, manufactured by Richard Merkle, St. Louis, Mo. For this wax is claimed superiority in color, purity, and general appearance. The Committee concede the excellence in color and appearance, and have tested it as to purity, but find the claim not fully substantiated.

1333. WM. GULAGER. Glassmaker's Litharge, manufactured by the New England Glass Co., Boston, Mass. The exhibitor claims judgment on its purity and general appearance. The Committee, on examination, find this to be a very superior article, and, indeed, the best that has as yet been offered for the special uses indicated. For superior Glassmakers' Litharge, *Bronze medal.*

1334. WM. GULAGER. Refined Saltpetre in Crystals, manufactured by G. R. Hendrickson & Son, New York. The exhibitor claims superior purity and beauty of appearance for this. The Committee, on testing, find that the first claim cannot be granted.

1335. WM. GULAGER. American Ochre, double-washed, manufactured by the Bermuda Ochre Co., Richmond, Va. For this ochre is claimed superiority in color, fineness, and quality. The Committee find it to be an excellent article, and to compare favorably with any in the market.

1339. CREW, MOORE & LEVICK. Display of Oils in bottles. As the exhibitors did not respond to the request of the Committee for samples for testing, we cannot pass any judgment upon them.

25. Jos. Wharton. Ores and Products of Nickel and Cobalt. This exhibit, considered as a whole, forms a prominent feature of the Exhibition, and shows great skill and knowledge in this most difficult branch of industry. Examination proves the nickel to be of very excellent quality, being almost free from iron, and entirely free from cobalt, but containing, like cast iron, both graphitic and combined carbon in small quantity. The oxide, also, and the beautiful series of salts exhibited show a high grade of purity for commercial articles. The cobalt, as well as its salts, which are by-products in the manufacture of nickel, are not so pure, although they show a marked improvement over similar productions of a previous date. Absolute purity of the cobalt compounds, however, would, under existing methods of separation, endanger the purity of the principal product—nickel. The copperas and blue vitriol exhibited are of a very superior quality. For superiority of nickel and nickel compounds, *Silver medal.*

F. A. Genth,
Saml. P. Sadtler,
George A. Koenig,
John E. Carter,
Committee.

II.—*Report of the Pharmaceutical Branch of the Committee for Class No.* 15 *of the Franklin Institute Exhibition.*

At a meeting held Nov. 5th, 1874, at the Philadelphia College of Pharmacy, the pharmaceutical branch of the Committee of Judges for Class No. 15, of the Franklin Institute Exhibition, report the following members present, namely, Professors J. M. Maisch and J. P. Remington, Messrs. G. Krause and R. F. Fairthorne. Samples of various medicinal preparations having been sent by the exhibitors, at the request of the Judges, for examination, together with specifications of the claims made by the manufacturers of the same, the Committee report that the first article examined was

802. W. F. Simes, Philadelphia. Compressed Camphor. Superiority to the refined camphor of commerce is claimed on account of greater compactness and durability, as being less volatile and less

liable to crumble. The members of this Committee admit his claim in regard to its durability, convenience, and non-liability to crumble, but are not prepared to acknowledge its possession of any advantage over refined camphor in other respects.

485. E. F. Houghton & Co., Philadelphia. Cosmoline. The proprietors of this substance not having supplied any information in regard to its preparation in the specification accompanying it, and the name failing to indicate its composition, the examiners were compelled to regard it as proprietary, therefore excluded from competition for award.

1369. W. B. Burke & Co. Hand and machine-cut Corks. It is the opinion of the Committee that claimants are deserving of credit for having more generally introduced the use of extra length machine-cut taper corks. *Certificate of Honorable mention.*

1434. W. B. Burke & Co. Bleached Sponge. The owners claim that by their process this material is not injured in texture or other respects. The particular method employed by them was not presented. The members of the Committee are unacquainted with any process by which sponge may be whitened without injury, and after a careful examination of the specimens sent to them, judging by the texture of the same, they are compelled to state that the process of the exhibitors forms no exception, although they acknowledge that the sponges were as well bleached and as fine in appearance as any they ever met with.

58. Mellor & Rittenhouse. Licorice, in mass and in stick. It was unanimously conceded that the mass licorice possessed all the characteristics of a good extract of the root, being free from the usual adulterations. Ninety per cent. of this was found to be soluble in cold water. The stick licorice was superior to the imported and account of greater and easier solubility, but it was the opinion of the Committee that it might be improved in flavor, and then equal and possibly surpass the best of the European manufacture. This firm is considered deserving of commendation for their efforts in making extract of licorice in this country. *Silver Medal.*

351. J. C. Baker & Co. Cod Liver Oil. This is considered a very good article, but no better than many other brands found in the market.

24. Chas. Lippincott & Co. Soda Water Apparatus. This firm claims award for the beauty of design and convenience of operation of their soda water fountain stands, also for superiority of syrup faucet and draught tube. The display made by this establishment was very commendable. The taste shown in various ways, such as arrangement and the conspicuous beauty of their stand, demands favorable recognition. *Silver medal.*

1123. McIlvaine Brothers. Powdered Drugs. These were found to be well and uniformly pulverized, and to retain the virtues pertaining to them, with the exception of those containing large percentages of volatile oil. For uniformity of pulverization,
Certificate of Honorable mention.

1195. Borden Meat Preserving Company. The extract made by this firm was not considered equal in taste or appearance to that of some other brands that are found in the market.

69. Hance Brothers & White. Non-wasting Percolating Apparatus. The members of the Committee acknowledge advantages in this form of apparatus when applied to some operations, but do not regard it as generally useful for the ordinary process of displacement.

585. Hansell & Brother. Apple Vinegar. This is excellent in flavor, and, having been tested, was found to be a good article.
Certificate of Honorable mention.

386. J. C. Hurst & Sons. Burdict's Oil Polish Blacking. This blacking possesses the property of imparting pliability to the leather after application. In regard to its polishing effect it does not appear superior to other blackings found in the market.
Certificate of Honorable mention.

Pills, Fluid Extracts, and other compound pharmaceutical preparations having been excluded from competition by the decision of the

Board of Managers, the Committee has not thought it advisable to enter them in this report.

F. A. Genth,
Robt. F. Fairthorne,
B. Howard Rand,
G. Krause,
Jos. P. Remington,
John M. Maisch,
Committee.

CLASS No. 16.—Fine Arts.

The Committee appointed to examine into the merits of Class No. 16 respectfully report that they have carefully looked over the various articles embraced in that department. The Judges regret that owing to the very short time intervening between the complete organization of the Committee (November 9th) and the closing of the Exhibition, it was found impossible to give a proper expression of the reasons that influenced them in their decisions, hoping that the recommendations may meet with your approval.

1486. F. Gutekunst, Photographer. Glacé Pictures.
Silver medal.

64. F. Gutekunst. Large Plain Photographs. *Silver medal.*

1485. F. Gutekunst. Large Crayon Photographs.
Certificate of Honorable mention.

1495. Broadbent & Phillips, Photographers. Glacé Pictures.
Bronze medal.

383. Broadbent & Phillips. Large Crayons. *Silver medal.*

122. P. E. Chillman, Photographer. Glacé Pictures.
Certificate of Honorable mention.

557. Suddards & Fennimore, Photographers. Large Colored Photographs. *Bronze medal.*

1004. Trask & Bacon, Photographers. Plain Cabinet Pictures. *Silver medal.*

663. A. H. Hemple, Photographer. Large Photographs of Engines and Machinery. *Silver medal.*

647. Jas. Cremer, Photographer. Stereoscopic Views in Park. *Bronze medal.*

275. R. Newell & Son, Photographers. Acid Proof Photo-Ware. *Certificate of Honorable mention.*

572. Wm. G. Entreken. Oscillating Enameler for burnishing Photographs. *Silver medal.*

666. F. Langenheim. Colored Albumen Magic Lantern Slides. *Bronze medal.*

568. John Carbutt, Superintendent of American Photo-Relief Printing Co. "As a type." For excellence in Lantern Slides and the reproduction of specimens of Bone, Tissue, Machinery, etc. *Silver medal.*

1056. Tilghman's Sand Blast. Etching Process. *Silver medal.*

The Judges recognize great value in this invention of Mr. Tilghman, and would have recommended this process as a suitable case for special award, had they not been informed that such an award had already been made.

599. W. E. Winner, Artist. Original Crayon Drawings.

722. B. Linfoot. Water Color Drawing. "South Transept Cathedral." *Certificate of Honorable mention.*

845. The School of Design. Drawings. Various subjects. *Not entered for competition.*

846. Samuel Sartain, Engraver. Steel Plate Engraving. *Silver medal.*

182. Osgood & Co., Boston. Heliotypes. An improved method of photo-mechanical printing. *Silver medal.*

698. James W. Lauderbach. Wood Engraving. *Silver medal.*

570. Breuker & Kessler. Lithographed Bonds, etc. *Silver medal.*

818. Thomas Hunter, Lithographer. Chromos. *Silver medal.*

796. Crosscup & West. Engraving on Wood. Machinery and Buildings. *Certificate of Honorable mention.*

114. Robert Steele. Illuminated Show Cards. *Bronze medal.*

385. Wells, Hope & Co. Patent Metallic Advertising Signs, lithographed, and type printed on tin. *Bronze medal.*

1519. Jas. S. Earle & Sons. Display of Roger's Statuettes. *Silver medal.*

226. Louis Dreka. Stationery. For artistic design and workmanship. *Bronze medal.*

231. Mason & Co. Stationery. For artistic design and workmanship. *Bronze medal.*

1149. Mrs. A. Pilkington. Wax Flowers and Preserved Geranium Leaves. *Bronze medal.*

18. Janentzky & Co. Artists' Materials, Oil Colors, etc. *Bronze medal.*

281. Benerman & Wilson, Publishers. Photographic Books. *Certificate of Honorable mention.*

439. Potsdamer & Co., Lithographers. Engraving Sharp, Shield Panel Work, and Spencerian Script. Excellent. *Silver medal.*

870. William Barber, Engraver. Case of Medals. *Not entered for competition.*

656. W. F. Geddes. Printed Fruit and Can Labels in colors. *Certificate of Honorable mention.*

371. Estate of Thos. Heath. Plaster Statuary. Decorations and Pedestals. *Bronze medal.*

1068. M. A. Torrey. Original Designs marked with Indelible Ink, with Quill Pen. *Bronze medal.*

1465. Geo. A. Rowe, Engraver. Frame of Cameos, and Intaglio Cuttings on Precious Stones: also, frame of Impressions on Wax. *Bronze medal.*

1500. W. Struthers & Sons. Carving in Caen stone, birds and snakes carved by Calder; also, carving in marble. Flower subject. *Not entered for competition.*

1501. J. A. Bailly. Colossal Statue of Gen. Antonio Blanco; also, bronze casting, Indian head, etc. *Not entered for competition.*

19. Janentzky & Co. For excellence in Water Colors. *Bronze medal.*

John C. Brown,
Isaac J. Williams,
W. H. McDowell,
E. Borda,
W. H. Willcox,
C. Alfred Gallett,
C. Seibler, M.D.
Committee.

SUPPLEMENTAL REPORT.

915. Longacre & Co. Engraving on Wood. *Bronze medal.*

E. Metcalf. Pen Pictures.

I. Repette. Wax Figures.

E. A. Kretchman. Model of Public Buildings.

STOCKTON STOKES. Crayon Pictures.

B. F. FERGUSON. Ivorytypes.

BENJ. SOLOMON. Cartoons in Plaster.

HORSTMANN, BROS. & Co. Embroidered Picture.

B. F. COOPER. Ivorytypes, Photographs, etc.

O. B. DEMORAT. Crayon Photographs.

T. W. ROGERS. India Ink Drawing.

RONTHOUX & WEBER. Crayon Portraits.

T. BROOKS. Glacé and Jewel Photographs.

C. E. BUSBY. Water Color Drawing.

MILLER & KRIPPS. Medallion Bronze Heads.

W. W. SEELER. Plain Porcelain Pictures.

These exhibits were entered for competition, and examined by the Committee of Judges.

JOHN C. BROWN,
W. H. MCDOWELL.

CLASS No. 17.—GENTLEMEN'S FURNISHING GOODS, INCLUDING CANES AND UMBRELLAS.

Having been appointed a Committee to examine the articles under the head of Class No. 17, we would respectfully report as follows:

155. WM. A. DROWN & Co. Umbrellas. We consider the display made by this firm as highly creditable, both for finish and materials, and as far as your committee is capable of judging, will compare favorably with any of foreign manufacture.

Silver medal.

1461. J. HERZBERG & BRO. We consider the article claimed by them as the "Patent Notch," a very great improvement in the manufacturing of umbrellas, and worthy of special merit.

Bronze medal.

163. John Wanamaker & Co. Clothing. The articles exhibited appear to be of excellent material and workmanship.

Certificate of Honorable mention.

223. E. O. Thompson. Pantaloons and other Garments. The quality and style of these goods are excellent.

Certificate of Honorable mention.

377. Ridgway & Oliphant. Gloves and Gauntlets. The goods exhibited by this firm we consider as first-class, and fully equal to any of foreign manufacture. *Silver medal.*

528. Wallace & Keller. Walking Canes. An excellent display, and entitled to special notice.

The shirts all seem to be of excellent material and workmanship.

621. Richard Eyre. Shirts.

Certificate of Honorable mention.

255. Sachse & Son. Shirts.

Certificate of Honorable mention.

178. Carpenter & Latimer. Shirts.

Certificate of Honorable mention.

325. Shedaker & Lindsay. Shirts.

Certificate of Honorable mention.

James D. Smith,
Joshua P. Ash.
Committee.

CLASS No. 18.—Gold and Silver Ware, Plated Ware, and Jewelry.

The Committee appointed by the Board of Managers of the Franklin Institute, to examine and judge of the intrinsic merit of articles exhibited in Class No. 18, would respectfully report, that in accordance with Rule 13, they have asked for, and received in writing from

the following exhibitors "the peculiar merits claimed for the articles exhibited by them for competition," and would submit the following as their opinion of the articles so exhibited:

157. HASTINGS & Co. Gold Leaf, etc. This firm present examples of gold in all its various stages of manufacture. This arrangement is very simple and complete, so much so that an inexperienced person can follow the intricate process from beginning to end without difficulty. The Messrs. Hastings & Co. stand at the head of their business, supplying a large trade in all the cities of the country. They specially prepare Gold Leaf for looking-glass gilders, bookbinders, and sign painters. The material furnished and workmanship thereon is first-class in every particular. No competition was had with this firm in this Exhibition. Their claim to having made Philadelphia the manufacturing centre of this trade seems to be well founded. The general excellence of the work, and character of material at all times employed, which has given this firm so enviable a reputation, would, in the judgment of the Committee, entitle them to especial consideration. *Silver medal*

1226. JAMES E. CALDWELL & Co. Sterling Silver Ware. Of old English design and great excellence of workmanship; also, Gold Jewelry of new design and careful finish. They have no competitors in this Exhibition in similar goods. *Bronze medal.*

202. LOUIS H. SPELLIER. Large Clock. Suitable for use in a bank, public institution, or, with four dials, in the tower of a public building or church. This clock is well made in all its parts, and is simple in its construction. It has *two* new features which are *original*, and invented by the Exhibitor, viz.: 1st. "Double suspension spring, in hanging the pendulum," thus avoiding any side motion from a heavy jar of any sort; and, 2d. "The anchor pin escapement," an improvement of value also when applied to watches.

Silver medal.

924. YOUNG & MCCULLY. Masonic Marks and Jewels. Of excellent workmanship and good design. Special excellence in the *diamond setting* in some of these jewels.

Certificate of Honorable mention.

1259. Heitel Brothers. Watch Movements. Very well made. Our attention was specially called to the "Spring Fork" (very delicately made), which has been introduced by them to prevent the breaking of the ruby pins when watches are subjected to violent or sudden motion, as in the cases of engineers, conductors, and those employed on railroads. This is believed to be a *new* and valuable improvement, and was shown and explained to your Committee, on application, by the inventors themselves. *Silver medal.*

902. Geo. P. Pilling. Masonic Emblems, Jewels, etc. With working tools employed in that as well as in other orders. There is engraving and other work upon them of a very neat character. The material seems to be all that is claimed for it, and the workmanship very creditable.

1343. Isaac Bedichimer. Masonic Marks and Jewels. Of very excellent original design, and workmanship, *Bronze medal.*

1355. Madame K. Schmitt. Hair Jewelry. A great variety of ornamental jewelry made from human hair, mounted in gold, such as watch-chains lockets, bracelets, etc. The work is of the best character, very neatly finished, and of great variety and ingenuity of design. *Bronze medal.*

All of which is respectfully submitted,

A. Loudon Snowden,
William Platt Pepper,
Hartman Kuhn.

Committee.

CLASS No. 19.—Hardware and Cutlery.

The undersigned Committee on Hardware and Cutlery respectfully submit the following report :

36. Hoopes & Townsend. Bolts, Washers and Wood Screws. *Silver medal.*

65. L. HERDER & SON. Shears and Scissors. Being a handsome display of their own manufacture. *Silver medal.*

99. MCCAFFREY & BRO. Files, Rasps, etc. Their own manufacture, which have stood the test and proved superior to any exhibited. *Silver medal.*

667. ALEXANDER KRUMBHAAR, Philadelphia File Works. Files. Exhibits a fine and varied assortment of his own manufacture, which proved second best in the test. *Bronze medal.*

148. HILLEBRAND & WOLFF. Sample Board of Locks. For a fine display of Trunk and Padlocks.
Certificate of Honorable mention.

199. STEWART, PETERSON & Co. Enameled and Tinned Cast Iron Hollow Ware. A first class display and worthy.
Silver medal.

225. HOWARD W. SHIPLEY. A handsome card of Pocket Cutlery, of Philadelphia manufacture. *Silver medal.*

332. N. & G. TAYLOR & Co. A handsome display of imported Tin Plate.

370. J. B. SHANNON. Builders' Hardware. A handsome display of his own manufacture. His skill in this line has added much to the comfort, convenience and safety of Philadelphia houses.
Silver medal.

898. CHAS. HUIE. Patent Horse Shoes. A fine display.

379. READING HARDWARE CO. General Hardware. Their apple-parers deserve notice.

421. WASHBURN & MOEN M'F'G CO. Manufacturers' Wire. A fine display, and deserves special notice. *Bronze medal.*

422. WHITE & SANSOM. Sample Card of Table Cutlery. Well arranged, and appear to be fair goods. *Bronze medal.*

438. RUSSELL & ERWIN M'F'G CO., New Britain, Ct. Builders' Bronze Hardware. Superior workmanship and fine finish.
Silver medal.

126. Andrew Rankin. Bronze Metal and Hand Plated Goods. His own manufacture. A fine display. *Silver medal.*

17. Yale Lock M'f'g Co. Store Door and Cabinet Locks and Latches. Capable of many changes, and is in excess of any tumbler lock made. *Silver medal.*

872. E. S. Wells. Spoon Pointed Wood Screw. For its novelty, *Certificate of Honorable mention.*

1007. G. W. Nock. Padlocks. A display of fair goods, but nothing new in construction.

1026. Penn Coal & Ice Co. Ice Tools. Examined the goods. Nothing worthy of note.

1085. Mallory, Wheeler & Co. Mortise, Rim and Padlocks. Worthy on account of construction and finish. *Silver medal.*

1338. Jas. McCormick. Keystone Burglar Alarm. Deserving of notice, has merit, and would effect what it is intended for.

1350. Philadelphia Tool Co. Davis' Patent Duplex Wrench. A fair display. *Certificate of Honorable mention.*

735. Barrows, Savery & Co. Enameled Cast Iron Hollow Ware. Do not make as extensive a display as others in the same line, but are worthy of notice for the quality. They make a fine display of Tailors', Hatters' and Sad Irons. *Bronze medal.*

763. John Booth & Sons. Brace Bits, Screw Drivers, etc. A large assortment, of good construction and fine finish. *Certificate of Honorable mention.*

859. L. Sykes & Co. Improvement in Nut Locks.

1365. Wm. Ruoff. Patent Jack Screws. Deserve a favorable mention on account of good points of construction. *Bronze medal.*

747. Wm. Baldwin. Steel Forging Hammers, Sledges, etc. Well constructed, and in high reputation among practical mechanics. They manufacture their own steel to make all their goods from. *Silver medal.*

203. Wm. P. Walter's Sons. Mechanics' Tools. A first class exhibit, of superior quality. *Certificate of Honorable mention.*

205. Harrisburgh Foundry and Machine Co. Improved Machinists' Vise. No point of interest.

950. Pugh & Bros. Auger Bits. The best known for construction and finish, adopted by first class mechanics.
Not entered for competition.

1380. H. Tarr & Son. Excelsior Dry Level. Have examined it. Useful for certain persons and purposes.
Certificate of Honorable mention.

453. Knickerbocker Ice Co. Ice Tools of superior finish, and make a fine display. *Bronze medal.*

471. Henry Disston & Sons. Saws, Tools, etc. A splendid display. The quality is of a character deserving the best award.
Silver medal.

475. Marshall Bros. & Co. Roofing Sheets. A fine display.

502. Field & Hardie. Tools, Handles, etc. A good exhibit. Also, a first-class window pulley, made with composition pins, introduced by them. *Certificate of Honorable mention.*

639. Thomas Morton. Sash Chains and Patent Attachment.

605. Union Manufacturing Co., New Britain, Ct. Heaton & Denckla, Philadelphia. Sample Card of Door Butts. Good quality. *Certificate of Honorable mention.*

1147. Charles Parker. "Hall's" Sudden Grip Vise. An improvement on Stevens' vise, being more convenient to persons using it. It is a decided advance in vises. *Silver medal.*

47. Stevens' Patent Parallel Vise Co. Vises. An exceedingly well-made vise. A fine display and worthy.
Bronze medal.

618. Enterprise Manuf. Co. Measuring Faucet. It is worthy of what it claims, to wit: economy, durability, and correctness.

1488. Enterprise Manuf. Co. Coffee Mills. *Silver medal.*

1507. Enterprise Manuf. Co. Spice and Drug Mills. They seem new and accomplish what they claim, to wit: facility of cleaning, capability of grinding hard substances, cheapness in repairs, etc. Tobacco cutter worthy of mention. *Silver medal.*

503. Hopkins & Dickenson, New York. Field & Hardie, Agents. Bronze Door Knobs. Two revolving show cards of bronze door knobs of fine quality and superior finish. *Bronze medal.*

630. Bayliss & Darby M'f'g Co. Wire Work. All kinds. A first-class display of useful and ornamental wire.
Certificate of Honorable mention.

212. A. B. Shipley & Son. Fishing Tackle. Make a very fine display of their goods, and worthy on account of the superiority of construction over all others. *Silver medal.*

771. Lloyd, Supplee & Walton. Scandinavian Lock. Well finished, but nothing new in construction.

772. Lloyd, Supplee & Walton. Bonney's Patent Hollow Auger. A good article. *Certificate of Honorable mention.*

773. Lloyd, Supplee & Walton. Patent Gate Hinge. Deserving of notice.

768. J. P. Verree & Co. Edge Tools. Make a fine display of hammers and hatchets. For their hatchets, *Bronze medal.*

1459. Geo. J. Grier. Model of Bevel Ship Saw.

375. T. B. Patterson. Adam's Patent Hand Truck.

1020. Jno. Krider & Co. Fishing Tackle.

335. Florence S. M Co. Skates.

757. G. & H. Barnet. Files.

1129. Jno. L. Mason. Patent Sheet Metal Screws.

1463. C. F. Harris. Patent Saw Filing Machine.

S. T. Latham,
Lewis R. Hassinger,
Chas. H. Abbott,
Rafael Estrada,
Committee.

CLASS No. 20.—Hats, Caps, and Furs.

The Committee on Hats, Caps, and Furs beg leave to report, that in consequence of the limited number of exhibitors there is very little competition.

1006. W. H. Oakford. Hats. Only contributor. His case of goods certainly reflects credit on him for the selection and arrangement of the articles, but he presents nothing new except in style. There are no improvements to mention.

Certificate of Honorable mention.

810. J. A. Stambach & Co. Furs. They make a very creditable display of furs, and have been to considerable expense in their effort, but we are compelled to say that the quality and make of their goods are not equal to those presented by F. K. Womrath.

Certificate of Honorable mention.

544. F. K. Womrath. Ladies' Furs. *Bronze medal.*

1371. G. Shoyer & Co. White Fox and Case of Birds. They are certainly beautiful.

J. B. Herron,
John Fareira,
Geo. H. Barnes,
Committee.

CLASS No. 21.—House and Building Materials.

The undersigned Committee, appointed by the Board of Managers of the Franklin Institute as Judges of the merits of exhibits in Classes No. 21 and 28, "House Building Materials, such as Marble, Iron, Stone, Tile, Terra Cotta Ware, etc.," met according to notice on Friday, the 22d inst., at 10 o'clock, and daily thereafter until the completion of their duties, and report the two classes together, as they were one Committee, and the exhibits were intervened in their entries.

TERRA COTTA WARE.

A good display by several depositors of this useful and important manufacture.

---

46. Wm. L. Wilson. Drain Pipe and Chimney Tops. Well executed. *Bronze medal.*

401. Fred. Gossin. Garden Statuary and Vases. Good designs and well executed. *Bronze medal.*

ARTIFICIAL STONE.

Artificial Stone, including Seagliola, of which there are several depositors, all of which fall below former exhibits, and not equal to their kind on the market for sale, although several are entered for competition. We do not recommend any of them for premiums.

MAREZZO MARBLE.

973. Marezzo Marble is manufactured from a petro-vitrifying concrete, as stated by the circular of Messrs. J. Travis Quigg & Co., the manufacturers, who make great claims for its merit, which are not sustained by the exhibit they make of the article.

STUCCO WORK AND PLASTER MODELS.

There are several depositors of those articles, but they are of no special merit; perhaps a reason may be assigned that this branch of industry is not so well sustained as formerly, from the fact that fresco painting has taken its place in the decoration of modern dwellings.

196. Dury & Mellish. Design and Plaster Ornament. A new design and well executed plaster ornaments.
Certificate of Honorable mention.

1223. C. Burnham & Co. Weather Strips. Formed of wood and rubber; to be applied to windows and doors to exclude water, wind, and dust, and well adapted for the purpose.

Certificate of Honorable mention.

97. Philad'a Architectural Iron Co. Galvanized Iron Work. A very excellent display; adapted for building purposes.

Bronze medal.

1138. McNeil, Irving & Rich. Patent Water-proof Building Paper. *Certificate of Honorable mention.*

1210. Jos. E. Billings. Universal Angle Brick. A very useful improvement. *Certificate of Honorable mention.*

35. Austin & Obdyke. For corrugated expanding Water Conductors, and for the method of putting up the same.

Bronze medal.

142. George Hays. Patent Sky Light. A method well adapted to make ridged sash bars in long lengths of galvanized iron, with provision to check and conduct the condensation on the under side of glass. *Certificate of Honorable mention.*

362. Wm. F. Scheible. Awnings and Decorations. A very creditable display. *Certificate of Honorable mention.*

For closing remarks and signatures, see Class No. 28

CLASS No. 22.—Housekeeping Articles.

The undersigned Judges of Housekeeping articles in the Franklin Institute Exhibition, respectfully submit the following report:

145. C. G. Blatchley. Horizontal Ice Cream Freezer (Tingley's patent). 1st. Economy of ice. The tub being closed at the end by means of a screw lever attached to the top hoop, prevents the waste of ice by the action of the outside atmosphere. 2d. Security against the salt water leaking into the can, by a beveled lid fitting tightly over an elastic gum gasket running around the outside of the

can. 3d. The horizontal position of the tub secures the uniform distribution of the salt water over all parts of the can, and therefore a uniform rapidity in the freezing of the cream within. The beater revolves independent of the can, so that the cream may be beaten as much or as little as may be desired. *Silver medal.*

234. Charles W. Packer. Cog Wheel and Double Action Ice Cream Freezer. This is an upright or vertical freezer, and claims merit as follows: 1st. The mechanical arrangement of the cog wheels. The wooden cross bar or lid upon the top of the tub, and containing the gear wheels, is hinged thereto, and may instantly be detached. The Double Action Freezers have the upper cog wheel placed upon the cross bar, by which arrangement it, as well as the driving cog wheel, is detached from the other gearing by simply turning the cross bar over, thus allowing access to the can. 2d. The dasher or beater, in addition to the pivoted scraper which conforms itself closely to the inner surface of the can, and removing the frozen cream as rapidly as formed, has deflectors in the centre and attached to the main shaft thereof, said deflectors acting upon the frozen cream in the same manner as paddles in freezing by hand; and also directing the unfrozen portions to the sides of the can, by which the whole body of cream is constantly changing position, and is most thoroughly beaten. *Bronze medal.*

346. John Gravenstine. Refrigerator and Water Cooler combined. 1st. It is air tight, and has a wonderful automatic circulation of cold, dry air (which was practically demonstrated). 2d. Having no drip outlet, they can be kept in the dining room and not soil carpets. 3d. The sightly appearance and handsome display. *Bronze medal.*

1197. Jeremiah Rohrer. Refrigerator, called "The Iceberg." 1st. For the peculiar construction of the ice box, which permits the cold air to pass directly down to the provision chamber. 2d. The arrangement for keeping the drinking water cold, by means of pipes forming the bottom of the ice box. 3d. The inside lining of this refrigerator is glass $\frac{1}{4}$ inch thick, so that it can be easily kept clean and sweet—a very important feature. *Bronze medal.*

732. Barrows, Savery & Co. Combined Refrigerator and Water Cooler. The peculiar merit of this refrigerator consists in its handsome, ornamental appearance, and the interior lining of porcelain. *Bronze medal.*

531. William Wiler. Stair Rods. A beautiful display, of superior workmanship, and beauty of design, combining ornament with utility. *Silver medal.*

279. A. & R. O. Applegate. Centennial Ironing Table. It is light, compact and portable, admirably adapted for the purposes for which it is designed. *Bronze medal.*

1100. E. S. Farson & Co. Self-Ventilating Refrigerator, (Schooley's patent). This refrigerator has been in the market for many years, and has had large sale. *Bronze medal.*

1518. F. G. Ford. Patent Coal Hod and Sifter combined. *Certificate of Honorable mention.*

578. Wilson, Wood & Co. Crockery Well Water Cooler. *Certificate of Honorable mention.*

1010. F. Lawrence. Revolving Flower Bracket. *Certificate of Honorable mention.*

435. Orum & Mellor. Gas Bracket Match Safe. *Certificate of Honorable mention.*

333. Amanda S. Sherwood. Fountain Griddle Greaser. *Certificate of Honorable mention.*

934. Thomas Mills & Bro. Steam Engine and Ice Cream Freezer combined. *Certificate of Honorable mention.*

291. Samuel Richards. Perfect Ice Cream Measure, and complete Butter and Lard Cutter, of novel construction.

347. John Gravenstine. Sideboard Refrigerator and Water Cooler combined; for his ingenious demonstration of its refrigerating properties, *Silver medal.*

843. L. B. Justice. Seamen's Ice Cream Freezer.
Bronze medal.

1361. John McConn. Non-Explosive Steam Coffee Pot.
Certificate of Honorable mention.

1388. T. B. Hagner. American Automatic Filterer.
Certificate of Honorable mention.

William Yarnall,
W. Barnet LeVan,
Pliny E. Chase,
Committee.

CLASS No. 23.—India-Rubber Goods.

We submit the following Report, together with a record of the experiments tried, to determine the relative merits of the goods entered for competition.

1409. A. K. Young & Conant Manufacturing Co., Boston, Mass. Gossamer Waterproof Garments. The cloth of which this clothing is made, is prepared by coating various light fabrics, such as silk, gingham, etc., with a smooth coating of rubber, thereby rendering the fabric waterproof, without adding materially to the weight; some of the lightest coats weighing only nine ounces, and others twelve ounces. Similarly prepared waterproof fabrics have been imported from Europe, and used to some extent in this country. We are of the opinion that this material, as exhibited, is an improvement in manufacture over the foreign goods, and recognize its merit as a new American production. The goods were submitted to the following tests: Heat, 200° Fahr. Cold, 3°. The material did not crack or become stiff with cold, or sticky and worthless by heat. The goods also appear to be waterproof, and favorably stood several severe tests to demonstrate that point. By a peculiar style of folding, the seams in these garments are also rendered practically waterproof.
Silver medal.

In India-Rubber Belting there were but two competitors.

1095. New York Belting and Packing Co. D. P. Deiterich, Agent. This belting is well made, a good quality of both rubber and duck being used in its manufacture. Several tests were made to determine the strength and quality of materials with a result as follows: Using the testing machine manufactured and exhibited by Riehlé Bros. Three inch wide four-ply broke at 3500 pounds; the same piece tested a second time, broke at 3000 pounds. For their Belting, *Certificate of Honorable mention.*

216. Boston Elastic Fabric Co. Potter & Hoffman, Agents. Rubber Fire Hose. Tests of two different manufactures of hose were made with the following results: The best sample four-ply steam engine hose, $2\frac{1}{2}$ inches diameter, burst at a pressure of 460 pounds to the square inch. For their Steam Hose,

Certificate of Honorable mention.

Albert G. Buzby,
James F. Stileman,
J. S. Hutchins,
Committee.

CLASS No. 24.—Iron and Steel.

The undersigned Judges, appointed by the Franklin Institute to examine into and report on the merits of manufactures embraced in the above class, have performed that duty, and present the following as the result of their observations.

1367. Pennsylvania Combined Iron and Steel Association. By virtue of this combination the liability of the steel to sudden fracture is overcome, the iron acting as a guard to the fine fibre of the steel. It has also another valuable property, in that it can be worked at a welding heat without injury to the steel. These peculiarities render it a very desirable article, as there are many purposes for which it is applicable. *Silver medal.*

716. Alan Wood & Co. Patent Planished Sheet Iron. A new American production of merit. *Silver medal.*

1136. Malin Brothers. Pig Iron. A fine display of samples of good pig iron from sundry makers.

Certificate of Honorable mention.

1324. American Tubular Iron and Steel Association. Tubular Wrought Iron. A new American production, combining lightness with great strength, durability and cheapness of production. *Silver medal.*

474. Marshall Brothers & Co. Galvanized Roofing Iron. A very fair display.

822. Susquehanna Iron Co. Merchant Bar Iron. Very superior samples, equal to any that we know of. *Silver medal.*

1330. E. J. Etting. Allentown Pig Iron. Splendid samples of iron. *Certificate of Honorable Mention.*

956. Fitzgerald, Flagg & Co. Cast Steel Castings. These are remarkable for their malleability and superiority of workmanship. This metal combines all the qualities of forged metal with the convenience of being shaped in moulds. *Silver medal.*

407. Philadelphia Hydraulic Works. Cast Steel Castings, made by McHaffie Direct Steel Casting Co. These are very ductile.. *Bronze medal.*

312. Hanson & Kirk. Cemetery Lot Inclosings. Railings, chairs, etc., of elegant designs, and substantially made.

Bronze medal.

1303. Goodell & Waters. Iron Castings. This display is first-class. *Bronze medal.*

215. Union Iron Co., Buffalo, N. Y. Potter & Hoffman, Agents. Heavy Beams. Excellent manufacture. *Bronze medal.*

216. Potter & Hoffman. Bay State Steel Boiler Plate. This metal is clear, uniform, and remarkable for its ductility in flanging.

Not entered for competition.

337. Charles H. Kellogg. Potter & Hoffman, Agents. Wrought Iron Columns. We consider them *light* and *strong*, and neat in form. *Certificate of Honorable mention.*

27. Philadelphia Galvanizing Co. Galvanized Iron. A fine display of excellent work, and of superior quality.
Silver medal.

606. Midvale Steel Works. Tool Steel. This is of superior quality and of uniform texture. *Silver medal.*

607. Midvale Steel Works. Steel made by the Siemens Martin Process. *Silver medal.*

479. Midvale Steel Works. Assorted specimens by these Works.

355. Miller, Barr & Parkins, Pittsburg, Pa. Cast Steel. For their fine specimens of cast steel, *Bronze medal.*

Chas. T. Parry,
Barton Hoopes,
Committee.

CLASS No. 25.—Ladies' Fancy Goods and Wearing Apparel.

We find in the list of articles submitted to us for examination, entries by thirty-two exhibitors; some of these have not been deposited. We report on such as we can find in the order in which they have been submitted to us. We have made careful examinations of all, not distinguishing in this respect between those entered for competition, and those on exhibition only.

---

72. Miss Williams. Afghan. The statement of claim submitted to us, declares this to be the first work of the kind ever attempted by the lady, and that the flower stripes are wrought entirely by herself, and not purchased for filling.

91. Birge & Berg. Artificial Flowers for Millinery. These are represented as having been made in this city. Knowing the value of this trade to France, we cannot but feel gratified that it has been so successfully introduced into this country. This industry, if fostered, promises to give employment to many women, and to cultivate a taste for the beautiful.

For artificial flowers for millinery, commendable for excellence in color, make, and very natural appearance. *Silver medal.*

282. Chas. Tage. Ladies' Dress Elevator. This contrivance is intended to convert train dresses into walking dresses; certain cords and loops being operated by two drawing-strings; these, when tightened and tied, elevate the skirts. We think the invention may prove a great convenience to many ladies.

283. Marter & Co. Ladies' Dresses and Sacques. Noticeable in this display is a very well made black silk dress, showing good taste and design; also, a very pretty white dress, suitable for evening wear.

294. Wm. Brooks. Millinery. The velvet bonnets shown, are of peculiar construction, being formed of one piece of material. For bonnets commendable for originality of design and good quality of material, *Certificate of Honorable mention.*

373. David Wood. Ladies' and Infants' Garments. The maker claims as a specialty "Clothing suitable for early childhood; also, ladies' under-garments." Some of the samples of children's clothing are very good indeed. For articles of infants' clothing, showing good design and neatness of workmanship,

Certificate of Honorable mention.

380. Mrs. E. Keyser. Children's Clothing. In commenting on this exhibit, we beg leave to call attention to the fact that the extended manufacture, for sale, of ladies' and children's clothing, is of recent date, certainly within the history of the sewing machine; our experience is that it has greatly increased in the past ten years. It gives employment to great numbers of working people, and has added materially to general convenience. As might be anticipated,

there are shown in this class grades in quality and in price. How far we should make the selling price a guide in determining the merit, we are at a loss to know; certainly some of the finer goods, wonderfully beautiful in their elaborate ornamentation, are quite out of the reach of persons of moderate means, but Mrs. Keyser can furnish well made goods, of neat, and even elegant designs, not too costly for the majority of purchasers. We can highly commend this exhibit. For excellent exhibit of children's clothing, well made, and of good design. *Bronze medal*

388. B. Linderman. Ladies' Underwear, and Children's Dresses and Cloaks.

441. M. Shoemaker & Co. Children's Clothing. A very fine display of costly goods and workmanship. No fault can be found in the quality of material, or the work upon it, and the designs show most exquisite taste. This we consider the best display of the kind in the exhibition. For children's clothing, well made, of the best material, and elegant design. *Silver medal.*

468. Ladies' Depository. Fancy and Useful Articles. This exhibit proceeds from one of the most useful charitable institutions in the City. Women in reduced circumstances can, through this association, find sale for their handiwork. Purchasers are assured that good, honest workmanship will be expended on what they require, and that the purchase money goes to those who often sorely need the aid. We earnestly recommend on the diploma the words "To the Ladies' Depository (a charitable institution, to be recommended to the attention of our citizens), for a display of fancy and useful articles, showing taste in design and excellence of workmanship." *Silver medal.*

529. A. W. Thomas. The Standard Lotta Bustle. This form of bustle obtains its name of "Standard," we presume, from a principle claimed by its maker in the introduction of "pillars, or standards (to use his words) formed of springs, which, while they maintain the form of the frame against pressure of the weight of the dress, yet yield when the wearer leans back in a chair. It seems well made, and is light, but does not appear to differ much from others in use.

530. A. W. Thomas. Perfect Bosom Form. It is claimed by the maker that this article exhibited is lighter than the so-called "pads," and can be worn with more comfort.

1268. A. J. Iander, Jr. Afghan and Needlework. These articles are certainly beautifully made. For very excellent workmanship on Afghan, lamp-screens and suspenders, *Bronze medal.*

1281. Wheeler & Wilson Mfg. Co. Sample Work on Wheeler & Wilson Sewing Machines. These are examples of sewing done by operators on the sewing machine of this house. The exhibit comprises many articles of ladies' wear, neatly and very beautifully made. For samples of beautiful stitching.

Certificate of Honorable mention.

1326. Miss M. Reeves. Millinery. The bonnets exhibited by Miss M. Reeves are of the best material, and appear to be very neatly made. The design is also good.

1368. W. B. Moore. Corset, Shoe, and other Lacings. The goods displayed we recommend for the manner in which the tip or tag is secured to the lacing; these tips used to be made of sheet metal bent around the lacing, and compressed with (in some instances) indentations, the more certainly to secure them. This invention consists in a solid metal tip of a fusible alloy, cast or moulded upon the lacing, which, so far as we are able to judge, seems to be very secure. We have taken some pains to experiment with this tip, cutting it partly away, and bending it back and forth, to try to break it. We think it an excellent article. For superior quality of tips, or tags used for lacing, *Bronze medal.*

1456. Mrs. M. E. B. Wynne, N. Y. Fancy Stitching on Shoes. This work consists of stitching done on leather in a very superior manner. Great skill in the use of the Wheeler & Wilson Sewing Machine, No. 6, is shown in this case. The greater part of the ornamentation is done by herself, without any previous drawing. For superior stitching on leather, *Silver medal.*

1464. Miss Maggie M. Doran. Glove Making on the Howe Sewing Machine. This lady claims to have made the gloves dis-

played by Messrs. Ridgway & Oliphant. The gloves are lap-seamed; this, in our opinion, is much better than over-seamed, being less liable to rip, or when ripped, less likely to run. The specimens shown compare favorably with the best imported articles in this line. For superior style of glove making, *Silver medal.*

1. Cook & Brothers. Hosiery Goods. This exhibit is of foreign make entirely, and cannot therefore enter in competition. Some of the articles do not properly belong to our class of goods, as there are many samples of gentlemen's furnishing goods in the case. Their display of silk stockings is remarkable; we have never seen any goods of the kind equal to them. They are said to have been made by George Brittle & Co., London, their factory is in Belper, Derbyshire. This house make imperial and spun silk hosiery and underwear; the samples of the latter are certainly very beautiful. In the same exhibit we saw merino underwear, from the celebrated house of Cartwright & Warners, England; their goods have a splendid reputation in this country, and we sincerely hope that both of these houses will exhibit in our coming Centennial Exposition, that their goods may come in competition with our home productions.

Not entered for competition.

In concluding our report, we must express our gratification in the, to us, unexpected insight afforded by the Franklin Institute Exhibition into the industries of our country. So habitual has become the idea that many articles of daily use can only be well made abroad, that now learning for the first time, of the existence in our own city, of factories and working people employed in making these very articles in so superior a manner, we cannot refrain from urging an inquiry for, and a trial of these home-made goods, and thus aid in fostering industries of so great use to our country.

Cora Sellers,
Mary M. Barker.
Lizzie S. Brown,
Emily L. Rawle,
Catharine K. Meredith.

Committee.

CLASS No. 26.—Lamps and Gas Fixtures.

In comparing the exhibits made by the two leading houses, Cornelius & Sons and Baker, Arnold & Co., your Committee have been impressed with the great variety in design and beauty of form and coloring of the majority of the goods exhibited.

The demand is probably greater in this country than in any other for elegance and harmony in the component parts of our every day surroundings.

The modern dwelling is becoming more and more the work of a skilled designer who must aim not only for beauty in the individual parts, but that those parts shall each contribute its share to a harmonious whole. In this view the Gas Fixture becomes an important element in the furnishing of a house, and the aim of every manufacturer must be, to be able to keep his store room supplied with designs to suit every taste. How successfully this is done, may be seen in these exhibits as well as in the show rooms of any of our leading manufacturers.

But it is not only in the houses of the wealthy that beauty is appreciated. There is a vastly larger demand created by a class which does honor to any community, and which so largely makes up our population; the working men. These, from various causes peculiar to Philadelphia, are able largely to live in houses of their own, and in those houses expect to have something better than straight pipes for gas fixtures. To meet this demand we have an almost endless variety of designs, not all of them beautiful to any one individual taste, as a matter of course, but nearly all of them appealing to some one's idea of grace in form and beauty in color, while still within the reach of those of moderate means. The fitting up of our stores and warehouses is another department in which we recognize this same condition of things—a growing demand for the beautiful. A glance backward at what was considered "good enough" twenty years ago, and what is demanded now, is very striking. Your Committee has been led to these thoughts by the general beauty of the display made by the two houses referred to.

---

100. Cornelius & Sons. Gas Fixtures. For general artistic arrangement, as well as variety and beauty of design and excellence of finish in individual specimens. *Silver medal.*

83. Baker, Arnold & Co. Gas Fixtures. For like merits. *Bronze medal.*

777. Wilhelm & Neuman. Street Lamps. For improvements in construction of lanterns for outdoor use, by which they are rendered free from the liability to fracture from expansion and contraction of parts. *Bronze medal.*

501. M. B. Dyott. Champion Street Lamps. For a handsome display of the same class of goods, which have many points of excellence; among others, convenience of access for cleaning, readiness with which they can be taken apart for repair, and a form which concentrates the light over the space to be illuminated. *Silver medal.*

204. C. Geforer. Gas Burners of many useful forms and applications, among which we would mention as specially noteworthy a convenient form of gas soldering tool supplied with gas through a flexible tube, giving the utmost freedom of motion, while it is kept equally heated to a temperature suited to the character of work on which it may be employed. *Not entered for competition.*

109. The American Reflector Company. Reflectors. For a good display of various forms, constructed with their patent diffusive surface, which breaks up the direct rays of light and gives the effect of daylight, so far as such an effect can be obtained from an artificial source. *Certificate of Honorable mention.*

1018. August Wilhelm. Ceiling Reflectors. For the ingenuity and skill shown by him in the design and construction of his ceiling reflector which by a correct application of the laws governing the reflection of light, makes it the most efficient article of this kind brought to the notice of your Committee. *Bronze medal.*

W. H. Merrick,
Wm. F. Miskey,
Rich'd McCambridge,
Jos. Manuel,
Theodore Bergner,
Jas. H. Windrim,

Committee.

CLASS No. 27.—Leather and Morocco.

We, the Judges appointed to examine the articles in Class No. 27, respectfully submit the following report:

191. Eckfeldt & Richie. Oak-tanned Butts for Hose and Belting. They claim their superiority exists in its being well filled out in the bellies and shoulders, of even thickness, and in consequence well adapted for fire hose and belting purposes, which, upon examination, we find to be correct, and pronounce it a superior article. *Bronze medal.*

211. A. C. McKnight. Waterproof Leather for Boots and Shoes. They claim that leather treated by this process is rendered waterproof and also improved in durability. An improvement in this mode of treating leather. *Certificate of Honorable mention.*

276. C. J. Spaulding. Hemlock-tanned Sole Leather. We think it a fair tannage of leather.
Certificate of Honorable mention.

434. Deitrich & Whittington. Marbled Sheep Skins. On examination we do not discover its especial merits, but as a new article of manufacture is no doubt creditable to the depositors.
Certificate of Honorable mention.

764. Chas. B. Williams' Sons. Oak-tanned Sole Leather. We think it a good, well-tanned article of good color.
Certificate of Honorable mention.

1445. F. Braun. American tanned and finished Calf Skins. In connection with this article we would submit a few remarks. In former years Philadelphia City tanned and finished calf skins were known all over the country, but of late years the French skin has taken the lead for superiority. The effort on the part of our manufacturers has been to produce an article that would compete successfully with the French, which heretofore has been only partially successful. The samples on exhibition we pro-

nounce to be the best skins at this time manufactured in America, and in point of tannage and finish approach the French skin very closely, and we think them entitled to the highest premium that your Committee can bestow. *Silver medal.*

HENRY W. OVERMAN,
LOUIS D. BAUGH,
GEORGE ELTON,
S. H. CRAWFORD,
THOMAS Y. ENGLAND,

Committee.

CLASS No. 28.—MARBLE, STONE, &c.

MARBLE WORK.

This branch is not equal to former exhibits, and we may assign as a reason that in our present style of buildings we do not, as formerly, take white sculptured marbles for decorations, but substitute dark colors of marble, wood, and slate in their place. At present the finest executions of marble work may be found in our cemeteries, and will compare favorably with any such work in this country. We have a number of well executed carvings on marble for our new City Hall, deposited by Messrs. William Struthers & Sons, remarkably well executed of their kind; also, a number of mantel pieces of novel decoration by the Tilghman sand blast process, and worthy of notice as well for their cheapness as for their novelty. This exhibit is not entered for competition.

396. ADAM STEINMETZ. Mantels. A good display, made of colored American marbles. *Bronze medal.*

1168. WM. R. HANSON & SON. Colored Marbles. A case of samples of colored marbles, from Lake Champlain, fully equal to the best imported foreign marbles. *Bronze medal.*

MARBLEIZED SLATE.

This is a branch of manufacture of considerable importance in this city, and the specimens on exhibition will, we think, equal, if

not excel, any similar manufactures. There are five depositors, and each has a special merit in his exhibit.

677. Thompson & Harper. Marbleized Slate Mantels. Four mantels, two of which are of a good design and fine color.
Bronze medal.

244. Chas. Williams. Marbleized Slate Mantels. A very large display and fine imitation of green marble. *Bronze medal.*

303. Wilson & Miller. Marbleized Slate Mantels. Designs, and one imitation of Belgian Black Marble. A good variety of designs, and one imitation of Belgian black marble, of which we have never seen its equal. *Bronze medal.*

321. Hayes, Coulter & Co. Marbleized Slate Mantels. Four mantels of good specimens of work, one of which is excellent in combination of color and design. *Bronze medal.*

40. J. B. Kimes & Co. Marbleized Slate Mantels. They have a good display of mantels and a variety of slate manufactures of great utility. *Bronze medal.*

130. J. E. Mitchell. Grindstones, Oilstones, Curriers' Block, and French Burr Millstones. *Bronze medal.*

And in conclusion, we say that we observed many exhibits of articles not entered for competition that were good in their line, but of no particular merit, calling special attention from us, and we have also passed over articles that were entered for competition but of no special merit, without noting our objection in each particular case.

John Baird,
R. P. Johnson,
S. A. Harrison,
Addison Hutton,
J. C. Sidney,
Committee.

CLASS No. 29–1.—Generators of Power.

We, the committee, appointed by the Franklin Institute as Judges of the above class, beg leave to report as follows:

1084. William T. Bates, Conshohocken, Pa. Feed-water Heater and Filter. In this apparatus the feed-water is filtered both before and after it is heated by the exhaust steam.

The motion of the water through the filters is *upwards*, preventing clogging of the filtering material which, after becoming fouled, can be cleaned in a few minutes by forcing live steam *downward* through it, each filter being provided, for this purpose, with proper inlet and outlet pipe.

By filtering the feed *before* it enters the heater, the latter is prevented from becoming inefficient from the deposit of mud upon its tubes, and by filtering it *after* being heated it is more thoroughly rid of impurities as it is well known that during the first heating of water most of the matters held in solution are precipitated.

The heater in this apparatus is a closed one with vertical tubes communicating with chambers at the ends, common to all the tubes, and through which the exhaust steam passes.

The feed from the top of the cold filter enters the heater near its bottom, and leaves at top to enter the bottom of the hot filter, passing through the space around the tubes. *Bronze medal.*

511. Waters' Patent Heater Co., Meriden, Conn. Waters' Patent Feed-water Heater. In this heater, the feed-water is brought into contact with the exhaust steam from the engine in the form of spray, and is drawn therefrom by the feed pump, at a distance above the bottom of the shell or casing, to avoid the sediment which accumulates there.

A blow-pipe and cock are attached to the bottom, and a hand-hole formed there for removing the sediment.

A glass gage is secured to the side of the casing to show the height of the water within. As in the old fashioned open heater, so in this, constant attention is required to prevent the over-flow of feed-water into the exhaust pipe, which extends upward in the centre of the casing to a point near its top.

Over the exhaust pipe and across it extends the spray pipe of the feed, and above this is a shield preventing the immediate escape of

the exhaust steam, and tending to deflect it downward upon the feed-water.

In the later forms, the exhaust pipe is bent at the top in the heater, and projects the exhaust steam downward upon the spray, the shield being, in this case, not used.

Experiments made with this heater show that the temperature of the feed-water can be constantly raised from the atmospheric temperature to the boiling point, and, at the same time, it may be freed from most of the mineral matter with which it may be charged before it enters the boiler.

The experiments also show that little or no grease enters the boiler with the feed, but unites with the sediment in the lower part of the heater. *Certificate of Honorable mention.*

690. Wm. J. Connery. Connery's Concave Caulking. To avoid the grooving of boiler plates in the use of the usual flat-nosed and sharp-angled caulking tool is the object of this method of making joints along the riveted seams of boiler plates.

The improvement consists chiefly in the shape of the caulking tool, which is semi-cylindrical and the relative diameter of the face of the tool as compared with the thickness of the sheet to be caulked, which is preferred by the inventor to be half the thickness of the sheet.

The great amount of weakening done to an iron plate or bar by a small groove or slight breaking of the skin of the iron is known to every engineer, and in the treatment of boiler plates it is especially necessary that every form of damage to them should be avoided.

The great superiority of "Connery's method" over the old, is made at once apparent, when we consider that the sharp nosed caulking tool cannot be used to drive metal to a line of perfect contact without going beyond it, even when most skillfully directed, and we do know that it is this driving of the tool beyond the seam which does irreparable damage to the under sheet.

In this view we regard this as a great improvement over the existing general method of caulking seams in metal. *Bronze medal.*

BOILERS.

In regard to the boiler trials, we are not prepared to report in detail, but recommend the following awards.

853. Harrison Boiler Works. Harrison Ten Slab Boiler. 1st. Best evaporative efficiency. 2d. Best economical capacity for generating steam. 3d. Best dynamic value of steam.

Silver medal.

710. Steam Generator Manufacturing Co. The Wiegand Sectional Safety Steam Generator. 1st. Good evaporative efficiency. 2d. Good dynamic value of steam. *Bronze medal.*

627. Norris Iron Co., Norristown, Pa. Norris Iron Company's Improvement on Rogers and Black's Boiler. 1st. Good dynamic value of steam. *Certificate of Honorable mention.*

287. Henry Snyder & Co., Philadelphia. The Shapley Portable Engine. For the best on exhibition. *Bronze medal.*

Washington Jones,
F. C. Prindle,
H. L. Butler,
John W. Nystrom,
John H. Cooper,
W. Barnet LeVan,

Committee.

For the record and all other particulars of each test, upon which the foregoing report is based, see Appendix.

CLASS No. 29–2.—Motors other than Water Wheels.

We, the Judges appointed to examine into merits of articles exhibited in Class No. 29–2, comprising "Motors other than Water Wheels," respectfully submit the following report:

101. Robert Wetherill. Builder and Exhibitor of Corliss Steam Engine. This engine is of the well known style of Corliss Engine, and has been running during the present Exhibition, driving one of the main lines of shafting with uniformity of speed. While

not possessing any new features, it is commendable for good workmanship.

	1st trial.
Horse-Power per Indicator,	40.42
* Horse-Power per Dynamometer,	36.672
Percentage of Useful Effect,	90
Percentage of Friction,	10

Bronze medal.

132. Wm. G. Rhoads. Wind Mill. The character of this machine is such that no test could be made of its capacity to perform its intended work, although no doubt exists, in the judgment of the committee, of its ability to meet its requirements. Commended as a useful adjunct to a farm.

158. A. Watson. Upright Steam Engine. This is a substantial engine, without unnecessary finish. Steam is admitted and discharged by a single ported slide, so proportioned as to cut off steam at one-half of the stroke. This engine was used by the committee on Class No. 29–1 to determine the dynamic value of the steam generated by the sectional boilers, and the committee on Class No. 29–2 refer to the report of the former committee for the power, etc., developed by this engine.

	1st trial.	2d trial.	3d trial.	4th trial.
Horse-Power per Indicator,	60.47	75.38	75.80	45.11
* Horse-Power per Dynamometer	53.03	65.23	66.412	40 264
Percentage of Useful Effect,	87.7	86.5	87.6	89.2
Percentage of Friction,	12.3	13.5	12.4	10.8

Bronze medal.

192. J. Heginbotham. Oscillating Steam Engine. The committee do not see any features worthy of special notice.

*Horse-power developed at 130 revolutions with 78 lbs. boiler pressure = 10.38.

248. J. Massey. Patent Elastic Metallic Piston. The spring of cast iron is not new, several having been made and put in use in 1859, but were found to be insufficient.

---

* See Supplemental Report, p. 125.

287. H. Snyder. Shapley Steam Engine. The committee see nothing deserving of special notice in the engine. The boiler and heater are good, and for test of these committee refer to report of Class No. 29–1.

389. Jacob Naylor. Horizontal Steam Engine. A handsome and well finished piece of work. It has been running one of the main lines of shafting during the present Exhibition. Works smoothly and regularly, and without noise. For test of this engine we refer to report of committee on Class No. 29–1.

* See Supplemental Report, p. 125.

	1st trial.	2d trial.
Horse-Power per Indicator,	41.73	53.14
Horse-Power per Dynamometer,	38.818	46.89
Percentage of Useful Effect,	93	88
Percentage of Friction,	7	12

For beauty of finish and smooth action, *Bronze medal.*

457. Wilbraham & Bro. Horizontal Steam Engine. A substantial looking machine. Not having been in motion, no test could be made of its efficiency. For excellence of design and proportion, *Bronze medal.*

495. Shive Governor Co. Shive Steam Engine Governor. Ingenious in arrangement and fitted with an automatic Safety Check, which closes the steam valve when the balls fall below a certain plane of rotation, by reason of the governor driving belt breaking or other derangement occurring to prevent the operation of the governor. *Certificate of Honorable mention.*

553. Jacob Naylor. Balance Slide Valve. This valve is fitted with rings on its back bearing in steam chest cover. It is fitted to engine (No. 389) by same depositor, on which it works well and requires but little power to move it.

Certificate of Honorable mention.

390. Jacob Naylor. Vertical Steam Engines of 6″, 8″, 10″ and 12″ Cylinders. These engines were running light during the Exhibition. Remarkable for elegance of design and just proportions. *Certificate of Honorable mention.*

391. Jacob Naylor. Piston. Plain and substantial, and not likely to get deranged.

210. Pusey, Jones & Co., Wilmington, Del. Tremper Cut-off. This is a cut-off for steam engines. The steam valve, which is balanced, is lifted vertically by the arms of a rock shaft, which take hold of jointed lifters attached to valve stem on opposite sides, and are held in position by a spring. The upper parts of their interior faces incline outwards. Just above these catches is a spindle, whose lower end is wedge shaped, and which has a vertical movement imparted to it by any variation in the speed of the governor, so that the inclined faces of lifters on valve stem as they rise by the motion of rock shaft, encounter the wedge, which moves them outwards, thereby releasing them from the rock shaft, which permits the valve to fall to its seat.

726. C. A. Cloud & Co. American Safety Stop Governor. The distinguishing features of this governor are:

1st. The valve, a hollow cylinder, sliding vertically within a cylindrical case, through both of which are cut corresponding horizontal slots for the passage of steam.

2d. An adjustable screw sleeve supporting the head which carries the spindle or valve stem, whereby the amount of steam passage way through valve and case may be regulated to suit requirements.

3d. The passage ways are entirely closed when the balls fall to their lowest position by the breaking of the governor belt or other reason, thus stopping the engine. This latter is a valuable quality.

1472. A. Watson. Steam Engine Governor. The features of this governor are somewhat like those of No. 726, but the arrangement of them differs.

1st. The valve of hollow cylindrical form slides in a cylindrical case; through both are cut horizontal slots or steam ways. These are spaced equidistant vertically in the case, but not so in the valve, where the spaces between the steam ways are increased in a certain ratio from the lower side of the valve towards the top, so that when balls are in a given position, the lower passage is on the brink of opening; as the balls are brought down the lower passage opens, and the next above is at the point of opening, and a continued downward movement of the balls opens successively the third and fourth

openings. This renders the valve more sensitive, and is therefore important. The passages are entirely closed when the balls are in their lowest position—a quality of great importance.

636. Jenkins & Lee. Marine Governor. A large model arranged for showing its operation when moved by hand. The spindle is intended to lie horizontally, but any change from that position does not affect its working properly, as the weight of the balls is counteracted by springs, whose recoil draws them towards each other as the centrifugal force diminishes. It is reported to be under trial by the U. S. navy department, and is used by some merchant steamers, but the results are not yet announced. However, the committee consider the design to be good, and that it will accomplish its intended purpose. *Certificate of Honorable mention.*

551. Richards & Pike. Barr's Elliptic Steam Trap. This trap consists of two curved tubes of brass, whose ends are secured together so that they form an ellipse. From the points of junction runs a restraining bar, which prevents longitudinal motion. At the middle points of the tubes are on one a valve seat, on the other a valve and connection so arranged as to open and close as these points change their position with reference to each other. If steam be admitted to the tubes, their increase of temperature causes an elongation which is resisted by the restraining bar. Consequently the tubes become more bowed, and the middle portions recede from each other and close the valve upon its seat. As the steam within the tubes condenses or is displaced by water, their temperature falls, producing a contraction of the metal and a diminished amount of bowing, thereby moving the valve from its seat and permitting the water to escape, when steam re-enters, causing the valve to again close. All the moving parts are accessible for examination. Two or more of these have been in operation on steam pipes during the Exhibition very satisfactorily. For simplicity and efficiency,

Certificate of Honorable mention.

1017. J. D. Lynde. Steam Engine Governor. This possesses the usual form of governors, except in the substitution of two cylinders connected by a curved piece for spheres or balls. The valve is balanced, being two discs connected. It also possesses the advantage of shutting off steam when the arms fall to their lowest point, by breaking of the belt.

181. C. C. Klein. Eccentric Steam Piston Engine. This form of engine is novel, and no opportunity was presented for testing its power or economy and use of steam.

392. J. T. Mecutchen. Patent Eccentric Hook. Intended to lessen and take up the wear on the pins of rock shaft arms and eccentric hooks. It consists of a brass box bored to fit the pin, and provided on one side with a gib that can be set out against the pin when necessary by reason of wear; the exterior of the box is nearly rectangular, sufficient taper being given to permit its easy entrance into a corresponding recess in the hook. The usual form of handle for disengaging is also attached. The whole comprises an improvement. *Certificate of Honorable mention.*

534. John A. Caldwell. Balanced Slide Valve. This deposit is a drawing only, representing a slide valve with a plate upon its back, which is faced off, attached to a copper diaphragm which is stiffened in its central part by iron plates. This diaphragm is held between the top flange of the steam chest and the bonnet, so that the plate on the back of the valve bears upon the latter. Steam pressing upon the under side of diaphragm balances that exerted upon the plate resting on the back of the slide valve, and thus the latter works with a lessened friction. As no tests were possible, the committee cannot report upon the reliability of its action.

592. Stokes & Parrish. Vertical Steam Engine. This engine has the usual form of small vertical engines. No test could be made of its power, as the requirements for attaching the instruments were not complied with by the depositors.

1036. Potter & Hoffman. Vertical Steam Engine. A neat and well proportioned specimen of its class. It was tested by committee on Class No. 29–1, by driving a fan when it developed

* { 156 revolutions, boiler pressure 66 = 6.915
  { 95 " " 67 = 4.29

Washington Jones,
James Hunter,
Chas. A. Doerr,
Edward Longstreth,
Committee.

---

* See Supplemental Report, page 125.

SUPPLEMENTAL REPORT.

At a meeting of Judges on Class No. 29–2, held January 18th, 1875, called for the purpose of filling in the blanks left open in cases Nos. 101, 158, 192, 389 and 1036 until the data of Class No. 29–1 could be obtained, in order to assist the Judges in making their recommendations for awards, they were ordered to be filled as appear in foregoing report.

WASHINGTON JONES,
CHAS. A. DOERR.

CLASS No. 29–3.—MACHINERY OF TRANSMISSION.

We, the undersigned Judges upon Class No. 29–3, "Machinery for the Transmission of Power," after a careful examination of the various articles, find the following to be worthy of reward. We therefore respectfully submit our Report to the Board of Managers for their inspection and approval. We call attention to

170. MURRAY BACON. Rotary Circulating Fan. For design. *Certificate of Honorable mention.*

141. GEO. V. CRESSON. Shafting, Hangers, and Pulleys. For the beautiful display, the design, finish and easy adjustment of hangers, and call attention to the split pulleys. *Certificate of Honorable mention.*

177. GEO. V. CRESSON. Internal Clamp Coupling for Shafting. For ingenuity, strength, and neatness. *Bronze medal.*

194. JOS. HEGINBOTHAM. Shafting Couplings.

306. WRIGHT & SMITH, Newark, N. J. Variable Speed Shafting. The attachment performing all claims made by the exhibitors. *Certificate of Honorable mention*

12. ALEXANDER BROS. Leather Belting. For superiority in manipulation and finish. *Silver medal.*

33. R. GRIMSHAW. 'Blake Hydraulic Hose.

183. Sellers Bros. Leather Belting. One of the main driving belts of the Exhibition. For strength and wear.

Bronze medal.

705. Mahlon Warner. Car Advertiser. We see nothing worthy of mention.

574. Jas. F. Tygh. Cigar Shield (self-pressing). For simplicity in construction, and economy.

Certificate of Honorable mention.

800. Jas. Eccles. Model for Patent Pivot Centre for Draw Bridges. The model performing all claims made by the inventor. *Silver medal.*

246. E. Ainsworth. Belt Clamps. Show durability, economy, and design. The principles being good, but faulty in construction. *Not entered for competition.*

1108. Jas. Scofield. Patent Device for Straightening Shafting, Tubing, etc. Nothing worthy of mention.

1439. Pusey, Jones & Co., Wilmington, Del. Expanding Pulleys For ingenuity, and performing all claims made for the pulley. *Bronze medal.*

1440. Pusey, Jones & Co., Wilmington, Del. Wire Guide. For durability and facility of manipulation. *Bronze medal.*

216. Potter & Hoffman Rubber Belting. It is a good display.

All of which is respectfully submitted.

Edw'd Longstreth,
John W. Nystrom,
Henry Cartwright,
Chas. T Parry,
H. F. West,
Wm. H. Thorne,
Chas. E. Ronaldson,
Committee.

514. Wm. M. Smith. Device for driving Sewing Machines with Variable Speed. We consider this better than any other similar device we know of.

Certificate of Honorable mention.

Edw'd Longstreth,
Chas. T. Parry,
Chas. E. Ronaldson.

---

153. Thos. J. Rorer. Improved Union Belting. For a combination belt we consider this article the best on exhibition, and of any we know of. *Silver medal.*

Chas. T. Parry,
Chas. E. Ronaldson.

CLASS No. 29–4.—Machinery of Transportation.

Please find the report of the Judges in regard to the following articles in Class 29–4, Machinery of Transportation.

7. The Wharton Railroad Switch Co. A full-sized Safety Railroad Switch. In this Switch both rails of the main track are unbroken, the parts exposed to wear are made of steel, and it has been in use long enough to demonstrate that it is sure in operation, and possesses a high order of merit. It is manufactured of good material and by special machinery. Its design, careful construction, and durability, and the certainty of its operation are such as to be worthy of high award. *Silver medal.*

6. William Wharton, Jr. Rail-Curving Machine. This is a strong, easily worked and efficient Machine for the purpose intended. *Certificate of Honorable mention.*

9. The Wharton Railroad Switch Co. Steel Railroad Frog. An excellent article; the proportions and workmanship are both good. *Certificate of Honorable mention.*

4. William Wharton, Jr. Steel Curves for Street Railways. These are well made, and apparently regularly Curved Rails, bent by the Rail-Curving Machine above mentioned.

629. George J. Woodruff, Norristown. Model of Railroad Switch, operated by the forward wheels of a Locomotive or Car. There is great ingenuity shown in the construction of this Switch, and the model works with a high degree of efficiency and certainty. Its being constructed out of proper proportion, however, may favor this result. Without the experience which could be gained only by a trial of it, full sized and duly proportioned, your Judges can only recommend an award for the great ingenuity shown in its arrangement. *Bronze medal.*

310. Nichols, Pickering & Co. Elliptic, Nest, Spiral and Volute Springs. These appear to be first-class articles, both in form and workmanship. *Bronze medal.*

260. Thomas McBride. Hydraulic Car Brake. This invention consists in the use of the boiler pressure direct in warm climate and weather, and of an intervening mixture of glycerin and water in cold weather, between the boiler and brake cylinders, which are placed one under each car, and operate the brake levers. The apparatus is exhibited full size, and in running order, and appears to work well. One of the Judges has had the opportunity of witnessing a series of experiments with a similar device, so far as the use of the boiler pressure is concerned, with a very satisfactory result. The importance of an arrangement that will check or stop a moving train in the shortest time and with the greatest safety cannot be over estimated. For so apparently successful an effort in this direction a practical trial of this brake is very desirable, and is earnestly recommended in order that its economy and efficiency may be fairly tested. *Certificate of Honorable mention.*

586. Parrish & Stokes. Elevator Winding Engine. The design and workmanship of this Engine are good, and the Steam Valve, which is the new and important feature in its construction, works remarkably well. *Bronze medal.*

648. Benjamin Tatham & J. W. Brittin, New York. Safety Catch for Elevators. Your Judges examined this device with much interest, on account of its novelty and simplicity, several of them having seen it operate at a time when its great feature of safety was called into requisition. The importance of the object

attained by the invention, namely, the prevention of serious accidents, by which life and limb are imperiled, the simplicity of its construction and the certainty of its action are such that an appropriate award should be made to the inventors, and with this end in view, we ask that the case be referred to the Committee on Science and the Arts, with a recommendation that the award of the Scott's Legacy Premium or of the Elliott Cresson Gold Medal be made to them. *Silver medal.*

653. J. H. Clark. Model of Railway Car. An ingenious device for the prevention of accident from persons falling on the track in front of the wheels; but its efficiency in practice could not be determined by the examination of the model.

700. R. L. Omensetter. Improved Construction and Ventilation of Car Bodies. This is a model which has been carefully examined, together with a copy of the patent and the description, without your Judges being able to find novelty or merit sufficient to warrant an award.

774. J. G. Brill & Co. Street Car Starter. The new and most meritorious feature in this Car is an arrangement for storing an amount of power from the momentum, at a time when the stoppage of the car is necessary, instead of having this power entirely consumed by the brakes. The car on a level or on a moderate up grade may, by means of this apparatus, be started forward by the driver by the motion of a lever, without any effort on the part of the horses. For the importance of this invention in saving horses from the great strain required to start a car, as examined in successful operation upon the car exhibited. *Bronze medal.*

1157. Lidgerwood Mfg. Co., New York. Challenge Reversible Hoisting Engine. This apparatus is driven by a rotary engine and is constructed apparently without reference to economy in the use of steam. The reversible feature is good and positive.

1272. J. Singer & R. Mench, Harrisburg, Pa. Singer's Patent Automatic Car Coupler. This Coupling is simple in design, not expensive in construction, and looks as if it would work well in

practice. In recognition of its being an apparently successful effort in the direction of saving life and limb,

Certificate of Honorable mention.

1444. W. A. Cummings. The Cummings Pneumatic Coupling. This is a model in which much ingenuity and good workmanship are shown; but its practical efficiency, combined with economy in construction and as a coupling for railroad cars were not manifest to your Judges.

1146. C. D. Alexander. McConnell's Automatic Car Coupler. Your Judges have examined this coupling, and are favorably impressed with its apparent safety and efficiency.

Certificate of Honorable mention.

730. Louis J. Pyott. Improved Brake Beam. This is a good and well constructed article, but precisely similarly constructed beams having been made and used in many cases for the purpose of combining strength and lightness, no novelty is apparent in this beam.

1115. Neafie & Levy. Hoisting Engine. A well arranged machine which seems to work well.

1230. Sellers Brothers. Wrought Iron Bridge Railing. For good workmanship, for excellence in details of construction, securing great durability combined with lightness, *Bronze medal.*

583. C. M. Hunt. Hunt's Automatic Railway.

584. C. M. Hunt. Hunt's Automatic Elevator. The models of this apparatus, for the unloading of coal from vessels and for the storing of it in bins upon the adjacent dock, were carefully examined, and there appeared to your Judges to be great merit in the simplicity of arrangement, ease of application and economy in the use of the apparatus.

583. *Bronze medal.*
584. *Bronze medal.*

1271. J. Singer, Harrisburg, Pa. McAllister's Improved Railroad Brake Shoe. For ease of application and simplicity of construction, *Certificate of Honorable mention.*

382. Davis & Foulk. American Road Steamer. This machine, so far as appeared when not in motion, is well arranged for the work it is designed for; but inasmuch as your Judges had no opportunity to see it in motion, they do not feel competent to decide upon the merits claimed for it.

Philadelphia, November 10, 1874.

Since making their report the Judges of Class 29–4 have had the opportunity to see the American Road Steamer in motion on Broad Street to-day. Considerable difficulty was found in getting out from the Exhibition building to Broad Street, partly, probably, from want of steam, and partly on account of the condition of the pavement, yet when attached to a large wagon, with a load said to be of 28 tons, it drew it with apparent ease from Chestnut to Sansom Street, turned around with it, and drew it back to Penn Street. This trial showed possibilities of usefulness.

Enoch Lewis,
For the Judges.

Certificate of Honorable mention.

625. A. B. Tripler. Tripler's Patent Railroad Crossties. The important questions in regard to these ties are as to their economy in cost, durability and endurance in service. Your Judges have no information as to cost, the limited time they have been in use does not warrant us in pronouncing authoritatively upon the other points, which can only be determined satisfactorily by extended trial.

1008. W. Cramp & Sons. Models of Steamships Pennsylvania and Ohio, and of City Ice Boat No. 2.

1034. J. T. Collings. Diligent Hose Co.'s Hose Carriage.

1114. Neafie & Levy. Model of a Tug Boat. The models enumerated above were examined by your Judges, and they were pleased with the ingenuity and skill shown in their construction.

Enoch Lewis,
Edward Longstreth.
T. J. Lovegrove,
Theodore Bergner,
Committee.

CLASS No. 29–5.—Hydraulic Machinery.

The undersigned Judges of Class No. 29–5 herewith respectfully beg leave to present their report. The various articles referred to us were examined and classified as follows :

106. R. D. Wood & Co. Mathew's Patent Fire Hydrant. This hydrant is the best of its class, and possesses the following specific advantages, viz.: The outside case or frost jacket, having a vertical play of several inches, prevents the frost heaving or breaking the hydrant. In case of obstruction in the valve or for repairs, the hydrant can be unscrewed from the brass socket in the bend below ground, and taken up, leaving the case in the ground, requiring no excavation or disturbing of the pavement, curbing, or sidewalk. *Bronze medal.*

693. R. T. H. Stileman. Fire Hydrants, Railway Water Columns for the use of Railroads, and Stop-valves for Gas and Water Works. For a general and creditable display, and more especially for stop-cocks and valves. *Certificate of Honorable mention.*

113. Cooper, Jones & Cadbury. Hand Pump. The Excelsior Improved Double-acting Suction and Force Pump. For general excellence and simplicity. *Certificate of Honorable mention.*

632. J. H. Billington & Co. Hand Pump. The People's Pump. This is both a lift and force pump, and possesses the merit of being easily changed from one to the other with little labor and expense. *Certificate of Honorable mention.*

247. E. L. Richie. Hand Pump. The Slouthour Bilge and Force Pump. This pump presents in a marked degree the important merits of simplicity, accessibility of all its parts, efficiency and cheapness. *Bronze medal.*

1482. Thomas Shaw. Shaw's Compound Propeller Pump. This pump throws an immense body of water, but there was no evidence before the Judges to show that it will do so with any greater degree of economy than well-known centrifugal pumps, with which alone it can be compared. This pump was a very attractive feature of the exhibition.

249. C. H. Hall & Co. Pulsometer.

967. F. B. Colton. Prall's Patent Aquometer. Steam Pump. These are modifications of the old Savery Engine, or the oldest known device for raising water by steam, with appliances which increase its simplicity, economy of construction, and efficiency, but there are no evidences presented that these devices perform their operations with reference to economy of fuel. In view of the above stated appliances, and for the superior mechanical construction of Prall's Aquometer, *Certificate of Honorable mention.*

446. Ferrell & Jones. Steam Pump. This is a direct acting fly wheel pump, provided with a pulley fly wheel so that any excess of power over that required in pumping may be readily applied to other purposes, and by simply removing a key the pump may be disconnected, and the engine used for general purposes. For excellency of design, workmanship, general efficiency, and utility. *Certificate of Honorable mention.*

The Direct Acting Steam Pumps of Messrs. Knowles, Selden, Blake, and Condé are mentioned for their respective designs, being creditable exhibits of well-known pumps in extensive use in which the valves of the engines are moved by steam, and are the best of their class.

1496. Wm. Sellers & Co. Injectors. The Judges desire to express their regret that the Giffard Injector was from motives of delicacy withheld from competition, it being superior in design and workmanship to any other exhibited, and possessing at the same time equal efficiency. *Not entered for competition.*

263. Rue Manufacturing Co. Little Giant Injector. For the ease and cheapness of the replacement of parts most liable to wear out. *Bronze medal.*

Isaac S. Cassin,
Henry G. Morris,
W. Barnet LeVan,
J. Vaughan Merrick,
Chas. E. Ronaldson,
E. D. Leavitt, Jr.,
Committee.

CLASS No. 29–6.—Machine Tools.

We, the undersigned Judges of Class No. 29–6, Machine Tools, having made a careful and thorough examination of the various exhibits of Machine Tools classified in 29–6, respectively submit our Report to the Board of Managers for their inspection and approval. We take pleasure in calling your attention to

21. P. E. Chase, Newark, N. J. Foot Lathes. We call attention to the following points as worthy of reward, viz.: being the best designed as a Back-geared Foot Slide Lathe; the manner of hanging the treadle-rod, the "set-over," tail-stocks for turning tapers.
Silver medal.

169. Murray Bacon. Hand Lathes. We call attention to the design and finish, durability and good work. *Silver medal.*

75. Keystone Portable Forge Co. Keystone Portable Forges. For design (manner of bracing), variety of form and durability; and we call attention to the Riveting Forge. *Bronze medal.*

98. Northampton Emery Wheel Co., Leeds, Mass., W. P. Walters & Sons, Agents. For strength and durability of Emery wheels. *Bronze medal.*

1513. Northampton Emery Wheel Co., Leeds, Mass., W. P. Walters & Sons, Agents. For originality and good work of their Stove Plate Grinding Machine. *Silver medal.*

105. Adam Newkumet. Keystone Crucible Machine. For simplicity, rapidity with which the work is performed, the form of the plunger or core, the application of the pressure, or motion of the core, being downwards and at the same time lateral or outwards.
Silver medal.

115. Wm. Sellers & Co. Machine Tools. We mention the Gear Cutter, for originality and ingenuity; also the Planer, the Nut Miller, Bolt Cutter, Steam Hammer, the Friction Feed on Machines and excellent workmanship. *Not entered for competition.*

129. J. Henry Mitchell. For superiority of Iron Boxes and fixtures for Grindstones. *Silver medal.*

147. E. Harrington & Son. Machine Tools. We mention the Drill Press (the manner of balancing); also the Extension Bed Lathe for its easy adjustment, and the design of the Slide-rest.

Not entered for competition.

228. Lehigh Valley Emery Wheel Co., Weissport, Pa. Emery Wheels and Grinders. For their adaptation to different kinds of work. For being inodorous, and for their durability.

Certificate of Honorable mention.

319. W. B. Bement & Son. Steam Hammer.

320. W. B. Bement & Son. Machine Tools. We mention for their Steam Hammer, the Cotter Drill, Vertical and Radial Drill Press, Axle Lathe, Shaper, and general good workmanship.

Not entered for competition.

345. John Bird. Press (portable) for Moulding Glassware. For the accuracy of the Moulds, their finish and their improvement over other similarly constructed ones. *Bronze medal.*

363. Oberlin Smith & Bro., Bridgeton, N. J. Set of Can-makers' Presses, Dies, etc. For their machines performing accurately *all* claims made by the Company, in a rapid and very satisfactory manner. *Silver medal.*

424. E. & A. Betts, Wilmington, Del. 30-inch Screw-Cutting Lathe.

425. E. & A. Betts, Wilmington, Del. 40-inch Radial Drill.

426. E. & A. Betts, Wilmington, Del. 36-inch Planer. We recommend the award of diplomas for good display.

Certificate of Honorable mention.

443. Thorne, DeHaven & Co. Radial Drilling Machines. We call attention to the adjustable double rachet feed on these machines.

444. Thorne, DeHaven & Co. Portable Drilling Machines. For heavy work, transmission of power in any direction, and universal application. *Silver medal.*

448. Kiehner & Odenatt. Valve-Seat and Metal Planing Machine. For the design, easy adjustment, and accuracy of work; and we call attention to the device for adjusting the tool in tool-post. *Silver medal.*

449. C. Van Haagen & Co. Machine Tools. For the Rotary Shaper, for ingenuity of design, finish, compactness of parts, and facility of manipulation, *Silver medal.*

1481. C. Van Haagen & Co. Twist Drill Grinding Machine. This Drill Grinder being compact, having the best arrangement for backing off the drills, and giving the proper bevel to the lips. *Silver medal.*

1233. The Tanite Co., Stroudsburg, Pa. Emery Wheel Milling Machine. For Milling Machine, for novelty of design, accuracy of working, producing a true surface upon the work, and a perfectly uniform wear to the wheel. We call attention to the rotary and at same time lateral motion of the wheel, and to the automatic feed of bed plate carrying the work. *Silver medal.*

533. Packer & Bates. Machine for Cutting Oval and Circular objects, and objects with straight sides and semicircular ends. For practicability, precision and variety of the work. *Silver medal.*

550. S. C. Forsaith & Co. Palmer Power Spring Hammer.

575. James F. Tygh. Tobacco Stripping and Booking Machine. For the general design and economy, there being little or no loss of material. The machine is easy of adjustment and performs its work in a rapid and satisfactory manner. *Bronze medal*

1183. L. B. Flanders. Patent Portable Cylinder Boring Machine. With these machines Steam and Blast Cylinders, Pump and Corliss Valves of all sizes can be bored in their present positions without removal. *Bronze medal.*

761. Ferris & Miles. Machine Tools. We call attention to their steam hammer, for compactness and ease of working. For their axle lathe, for good design, proportionment of parts and good workmanship. *Silver medal.*

1514. C. M. Ghriskey. Portable Forges. For easy working and design. *Certificate of Honorable mention.*

912. Henry Snyder & Co. Ames' Engine Lathe. For the facility with which right and left hand threads can be cut, and the ease and rapidity of adjustment. *Silver medal.*

968. Charles Crosseley. Patent Mill Picks. For skill in forging, shape and neatness of finish. *Bronze medal.*

1024. Allison & Bannan, Pottsville, Pa. Allison's Patent Boring Machine. For simplicity of design, general adaptability and durability for heavy work. *Bronze medal.*

1047. Geo. Richards. Twist Drill Grinding Machine. For efficiency and workmanship. *Certificate of Honorable mention.*

1082. E. & A. Betts, Wilmington, Del. Reder's Pat. Adjustment for Lathe Tool Posts. For parallel adjustment, facility of manipulation and strength. *Silver medal.*

1237. I. H. Shearman. Johnson's Lathe Chuck. For firmness and durability, adaptation to variety of work, general design. *Bronze medal.*

1192. T. R. Evans. Evans' Indexical Revolving Boot and Shoe Trees, Stretchers, &c. For design and durability. *Bronze medal.*

1238. R. L. Howard & Son, Buffalo, N. Y. 6-inch Schlinker Bolt Cutter. *Certificate of Honorable mention.*

1239. Hill, Clark & Co., Boston, Mass. No. 3 Brainerd Miller. For superiority, variety of work, and good workmanship. *Bronze medal.*

1240. Hill, Clark & Co., Boston, Mass. Index Miller. *Certificate of Honorable mention.*

1241. Wood & Light Machine Co., Worcester, Mass. No. 1 Bolt Cutter. *Certificate of Honorable mention.*

1295. W. D. Chase Manufacturing Co., New York. Chase's Pipe Cutting and Threading Machine. For compactness, satisfac-

tory manner of performing work, rapidity of work done, strength and durability. *Bronze medal.*

1311. KEYSTONE FORGE CO. Pressure Blower. For general design and performing work claimed for it. *Bronze medal.*

1494. D. P. DIETERICH. Vulcanite Emery Wheels. For superiority of wear, durability and strength. *Silver medal.*

1510. P. H. & T. N. ROOTS, Connersville, Ind. Portable Forges. For neatness of design, portability, and the blower attachment. *Silver medal.*

All of which is respectfully submitted.

SAM'L ARCHIBOLD.
EDW'D LONGSTRETH.
W. B. REANEY.
C. CHABOT.
L. L. CHENEY.
ALEXANDER WANICH.
GEO. V. CRESSON.
CHAS. E. RONALDSON.
WM. S. COOPER.
Committee.

1127. JOHN L. MASON. Tire Shrinker. This being the best machine for the purpose known to this committee. *Silver medal.*

1256. C. J. GARDNER. Saw Grinding machine (model.) *Certificate of Honorable mention.*

E. LONGSTRETH.
CHAS. E. RONALDSON,
SAM'L ARCHIBOLD.
Committee.

To Committee, Class No. 29–6.

GENTLEMEN:—The sub-committee appointed by you to test the merits of the "Root Blowing Machine," and the "Baker Blowing Machine," attended to that duty, and we believe that all parties

were satisfied with the thorough and fair test to which both were subjected. We took the capacity of the two machines from the printed circulars of each respectively; the "Root Blower" being rated to discharge 13½ cubic feet per revolution, and the "Baker Blower" 12 cubic feet per revolution. The instrument to test the speed of the machine was applied 4 times to each during the test.

The "Root Machine" was speeded to 180 revolutions per minute, and in order to make both machines equal in discharging through holes of equal size, it was found necessary to speed the "Baker Machine" up to 202 revolutions per minute, at which speed the latter machine indicated 20 oz. average on the pressure gauge, the variations being from 19 to 21 oz., and the pulsation about 6 oz.; at a speed of 180 revolutions per minute, the machine indicated 18 oz., very steady, the variations being not more than ½ oz. in either direction, while the pulsations were about 5 oz. The "Root Blower," at a speed of 180 revolutions per minute, indicated an average of 17 oz. pressure on the gauge, and at no time reached above 18 oz. while sometimes falling as low as 15 oz. The pulsation was so great, that the needle of the instrument became invisible from the rapidity of its movements. The speed of the machine was found to be uniform during the entire test. We then tested both machines run by the same engine, 3 indicator cards being taken during the test in each case, and continued the test 10 minutes in each case with the following results.

The "Baker Machine" was run from 3h. 5m. o'clock to 3h.15m. o'clock, the counter registered during the test 1517 revolutions; the pressure gauge indicated 12 oz., very steady, and the pulsation 5 oz.; the average power consumed being 8.13 H. P.

The "Root Machine" was run from 4h. 5m. o'clock until 4h. 15m. o'clock, making in that time 1500 revolutions by the counter; the blast pressure indicated by the gauge was 11½ oz. on the average, standing part of the time at 12 oz. and sometimes falling as low as 10 oz., the pulsations as before being so great as to make the needle invisible, the power consumed being 8.43 H. P.

Your committee also carefully examined each machine relative to the points as claimed by the "Baker Machine," (a copy of which is herewith submitted) and have decided as follows on each claim separately:—

1st. "Strength." We see no difference.

2d, "Durability." We feel justified in saying that the "Baker Machine" is so construeted, that time will prove it eminently entitled to first place on this claim.

3d. "Fewness of parts." Allowed.

4th. "Ease of motion." This is proved by the amount of power consumed.

5th. "Less pulsation than any other of its class." The facts given above fully establish this claim.

6th. "Can be run direct from an engine." Its facilities in this respect are decidedly superior.

7th. "Will not be effected internally by wearing of gears." It has no internal gears.

8th. "Requires no lubrication whatever, internally." Very superior in this respect.

9th. "Requires no dubbing to make it temporarily tight." Very superior in this respect.

10th. "Will exhaust as well as blow." We did not test this.

11th. "Dust will not injure it." It certainly cannot.

12th. "Dampness will not change its form." It certainly cannot, as it is constructed of iron and steel exclusively.

14th. "It runs steady, without jerking the belts." We had no means of deciding on this claim.

15th. "Will blow hot or cold air equally well." Allowed; we believe this to be a very important point.

16th. "It requires less power for the amount of air discharged." This is proved by the indicator cards.

17th. "Its entire absence of friction internally." This claim is very decidedly sustained, while the "Root Blower" has, and it must vary considerably in the latter.

Your committee are therefore of the opinion that the "Baker Machine," has proved itself the best in every respect.

458. T. Wilbraham & Bros. Baker's Pressure Blower.
Silver medal.

Wm. S. Cooper.
C. Chabot.
L. L. Cheney.
Committee.

CLASS No. 29-7.—Wood Working Machinery.

The Judges on wood working machinery would report as follows:

300. Trump Bros., Wilmington, Del. Fleetwood Scroll Saw. This was considered to be the best saw on exhibition for the purpose. It enables the American public to compete with work heretofore imported and opening a new branch of industry to females and minors. For its adaptability to so many branches of business, as well as its being a promoter of the mechanic arts in the family.

Bronze medal.

307. Power, Tainter & Co. Woodward Double Surfacing Floor Board Planing Machine. As being the best surfacer and matcher of the kind, *i.e.*, with solid bed and feed rolls.

Bronze Medal.

494. R. McChesney, Ilion, N. Y. McChesney Truss Am. Scroll Saw. On account of the clamp for the saw, which in the opinion of the committee is the best they know.

Certificate of Honorable mention.

535. Richards, London & Kelly. Wood Working Machinery. The committee would specially call attention to the fine display made by this firm, it being the largest and most attractive in the exhibition of the various kinds of wood working tools.

Not entered for competition.

540. D. S. Lattimore. Planing Machine Duster, McClellan's Exhaust Fan. This is the best machine known for the purpose and it adds greatly, by its use, to the safety of a planing mill, by carrying all the shavings to a fire proof receptacle. It also promotes the health of the workman by removing dust. *Silver medal.*

593. Goodell, Braun & Waters. Endless Bed, Double Surfacer and Matcher. The best constructed machine of the kind known to the committee. The proportion and workmanship have been carefully attended to, much more so than has heretofore been usual with wood working machinery manufacturers. *Silver medal.*

594. Goodell, Braun & Waters. Heavy Bar Mortiser and Borer. The committee consider this machine to be the best one known for heavy car work, &c. *Silver medal.*

1054. Walker Bros. Seroll Saw. This is the only saw of the kind competing. For even tension and ready adaptability to purposes required. *Certificate of Honorable mention.*

1145. J. H. Blaisdell & Co. Sash Boring and Grooving Machine. Would suggest that this machine should be more substantially and perfeetly eonstrueted. *Certificate of Honorable mention.*

1436. Jas. M. Seymour, Newark, N. J. Sash Dove-tailing Machine. The machine is not well enough eonstrueted, the work being rough, but the general arrangement is good.
Certificate of Honorable mention.

1490. Power, Tainter & Co. Re sawing machine. This machine is the best adapted for the work of any that is known to the committee. *Silver medal.*

1491. Power, Tainter & Co. Combined Sash Sticking and Moulding Machine. *Certificate of Honorable mention.*

J. Ferdinand Madeira.
Jas. W. Cooper.
H. W. Curtis.
Edwin Harrington.
Edward Longstreth.
Geo. W. Waitt.
Geo. V. Cresson.
D. E. Rice.

CLASS No. 29–8.—Textile Machinery.

Your Committee would respectfully submit the following report:

41. H. W. Butterworth & Sons. Warp and Cloth Drying Machines. We find the merits:

1st. In the arrangement of the stuffing box, allowing inerease of bearing in journal, which makes it very accessible for packing.

2d. Application of steam at opposite ends of top and bottom rows of eylinders, securing uniformity in drying several widths of goods.

3d. Improvement in buckets for discharging condensed water, the cylinders being divided into sections, and the water carried from one to the other, and finally discharged through the journal, which not only keeps the cylinder entirely free from water while in operation, but also prevents the deposit of sediment. *Silver medal.*

1397. Thos. Wood. Three-Box Power Loom. We find the power loom to possess the following merits:

1st. The picking motion and large journal of the crank, two very important points in the light and easy working of the loom.

2d. The arrangement of the box motion, which is perfectly positive in its movements either on full lift or full drop, and so mechanical and complete that it can be run at the rate of over 170 picks per minute, working skip box, and over 200 in regular box motion.

Silver medal.

1398. Thos. Wood. Winding Machine. On examination of the winding machine we find a reduction of friction on the yarn, by the use of a cone instead of a cup former, which prevents burning and shading of delicate colors. *Certificate of Honorable mention.*

545. Dienelt & Eisenhardt. W. V. Gee's Power Carpet Loom. The above loom works without shuttles, taking its filling direct from large bobbins, which can be replaced without stopping the loom, thereby saving time. We find that it can be run at a more variable speed than a shuttle loom. The arrangement of the Jacquard motion, for making changes of color, is very ingenious.

Silver medal.

826. Wm. McArthur & Co. McArthur's Steam Feather Renovator. This is a machine well adapted for the thorough cleansing of feathers. It consists of an arrangement, in one machine, for steaming and removing the dust from feathers. *Bronze medal.*

1441. Tusey, Jones & Co., Wilmington, Del. Rag Cutter. Your Committee find this to be a well-constructed and very powerful machine, well adapted to the purpose. *Silver medal.*

775. Bridesburg Mfg. Co. Improved Excelsior Spinning Frame. The section of spinning frame made and exhibited by

Bridesburg Mfg. Co. was thoroughly examined, and we were of opinion that it was not of sufficient merit to recommend an award.

827. Wm. McArthur & Co. Steam and Hot Air Carpet Cleaning Machine. The model of patent steam and hot air carpet cleaning machine, is a very ingenious machine.

Certificate of Honorable mention.

180. Thos. Wood. Single Box Power Loom. The Star Loom is a very superior loom. *Silver medal.*

884. R. B. Goodyear, Wilmington, Del. Four-Shuttle Check and Gingham Loom. The box-motion on loom deposited by R. B. Goodyear was examined, and though Mr. R. B. Goodyear had our full sympathy, we were compelled to recommend the award to his opponent on merit alone.

Wm. Divine,
James Whitaker,
Wm. E. Trainer,
Charles Hill,
Committee.

CLASS No. 29–9.—Sewing Machines.

Your committee have attended to the duty assigned them, and after a very careful and close examination of the various articles exhibited in this class, would most respectfully offer this as their report.

28. Cutlan Shoe Sewing Machine Co. The Cutlan Shoe Machine. This machine entered for competition, and is designed for making turned shoes by sewing the soles to the uppers with wax thread, using a tambour stitch.

After a careful examination we find the distinguishing features are

1st. A revolving needle bar as a cast off.
2d. A presser bar locked upon the work.
3d. A resisting bar locked under the work.
4th. A lashing adjustment to the feed wheel.
5th. Work resting or supported on feed wheel.

All these claims and features we have carefully considered and examined, together with the quality of work produced on this machine.

Silver medal.

324. Geo. C. Walters. The Wet Skin Sewing Machine. This machine we also carefully examined and submit the following:

The sewing of wet skins is a branch of manufacture that has long been done by hand, which requires a long time and is done in an imperfect manner and with more waste of material than is now done by the use of Geo. Walters' wet skin sewing machine. There have been frequent attempts by others to successfully accomplish this operation, but all others have failed on account of not being able to feed the skins through the machine, on account of their slimy and slippery nature. Mr. Walters has overcome this difficulty by applying a clamp feed to his machine, which operates simultaneously from top and bottom, clamping the skins firmly and allowing no slip. There are many other good features about this machine which combine to make it superior to any other for like purpose. *Silver medal.*

118. Rex & Bockius. The Goodes Sewing Machine. This machine has new and useful features. The most prominent of which are the use of two needles, in a revolving bar crossing the upper threads at every stitch, while the shuttle thread locks them both. The shuttle thread does not lie parallel to the line of seam, but crosses from one needle to the other at every stitch, thus making a very ornamental, elastic and strong stitch, all of which is claimed and we believe to be entirely new. The feed bar has an automatic lateral motion in addition to its forward motion, which will make zigzag, waved or angle lines at pleasure. This result is also produced by new and ingenious mechanism. It will make a lock stitch over seam. It will sew two parallel rows either straight, waved or zigzag at the same time, and by using one needle it will make the ordinary lock stitch, and is equal to a first-class family machine.

Silver medal.

418. A. B. Felt & Co. The Vertical Feed applied to the Davis Sewing Machine. The prominent feature of this machine is its peculiar feed, which operates above the material and whilst the needle

is in the goods, both moving together. This feature of the feed produces such results as to warrant us in recommending a premium. For vertical feed applied to the Davis sewing machine.

Bronze medal.

1086. Jos. J. West, New York. The Duplex Braiding and Embroidering Attachment of Jos. J. West. This is a new and useful attachment to sewing machines, and will make braid from spool cotton or other material (in the form of yarn or thread) laying it as made on the material, in such a manner that the machine sews it on as fast as made. This attachment can be applied to any under feed machine as a presser foot. The motion is communicated to this attachment from the needle bar in a simple and effective manner and will do all that is claimed for it, in a substantial manner.

Certificate of Honorable mention.

313. Cyrus S. Cushman. The C. S. Cushman attachment to the Howe Machine, for zigzag and other ornamental stitching and over-seaming. C. S. Cushman entered for competition two attachments for zigzag and ornamental stitching and closing seams by overseaming, for which he claims the following:

Providing for the ordinary wheel feed sewing machines, a four motion or step feed attachment and giving to it a reciprocating motion for doing ornamental stitching and for closing seams by overseaming. This attachment is so constructed that it can be readily applied to the Howe sewing machine without altering the machine. The forward motion is produced by the ordinary mechanism of the machine and the lateral motion is communicated by a small cam through a piston connected directly to the feeding plate and close up to the work, thus avoiding loss of motion, which occurs in wheel feed attachments. The roughened feed surface drops and releases the material after each stitch, allowing it to be freely turned upon the needle as a pivot, thus causing uniformity of stitch in turning curves. After a careful examination we believe this attachment to be superior to any for like purpose.

Bronze medal.

187. F. Henry. Goodrich Attachments. The attachments have been examined, and we find them to be generally used by the sewing machine companies, and are giving general satisfaction.

Not entered for competition.

437. The Adjustable Table Co. Adjustable Sewing Machine Table. This is the only table on competition for like purpose, and we find on examination that it is simple in its construction and substantially built. The principal features and claims are, that the table can be placed in any position, without detaching the machine or belt, thereby enabling the operator to sit in whatever position is the most comfortable. This is claimed to be less tiresome and more beneficial to the health of the operator, and is endorsed by many leading physicians. *Certificate of Honorable mention.*

1342. J. Thos. Jones. "Eureka," the Anatomical S. M. Treadle. This is a treadle which can be placed on any sewing machine, and gives a walking motion without a side strain on the ankle, and is susceptible of four changes of position of the foot. *Certificate of Honorable mention.*

397. Jno. Mundell & Co. Machine for Screwing Soles on Boots and Shoes. This machine is designed for securing the soles to the uppers of shoes by means of a screw made on the machine and screwed into the leather at the same time. A careful examination has shown us that this machine is a fine exhibit of mechanical ingenuity and skill, showing a successful and practical result by which one hundred and twenty pairs of shoes can be made per day. There are many interesting points about this machine which we deem unnecessary to mention. For its ingenious and mechanical construction, and quality of work produced thereby.

Bronze medal.

1489. A. C. McKnight. The American Cable Screw Wire Machine for Boots and Shoes. This machine is designed for the same purpose as the brass screwing machine of Mundell & Co. This machine uses square wire twisted into the form of a rapid pitch screw, called cable wire. This wire is fed from a coil into the machine, and cut off in suitable lengths, and driven into the leather by a powerful spring, and the *supposition* is that the wire or screw is revolved while being driven in, which would screw the leather together. This machine also shows great thought and careful mechanical construction, and is capable of working very rapidly and will produce five hundred pairs of shoes per day, in a condition that requires but little handling to finish up. *Bronze medal.*

It was considered advisable by this committee, to place the following machines in one class, and mention each one separately, as they were brought up before us, the reason for this is that we see no particular or new claim in any one machine over the other, that would entitle it to a special or higher reward; but all were considered worthy of separate and honorable mention.

314. The Singer Manufacturing Co. exhibited quite a number of light and heavy machines, and made a very creditable display.

Not entered for competition.

272. The Howe Co. also exhibited quite a number of machines and some very fine samples of embroidery and leather work. They also exhibited the Manning Manufacturing Machine, now owned and made by the Howe Machine Co. This machine we deem worthy of honorable mention, for the following reasons:

1st. The combination of an arm and platform machine, the arm being so arranged as to pass through the smallest gaiter upper, thus allowing front and back stays to be stitched on without being pasted, or turning the upper inside out, thus preserving the upper in its original shape. Counters or straps can be stitched over the seams of shoes after they are seamed up at the side and turned right side out.

2d. A presser that can be changed while the machine is running, from a stationary to a vibrating presser, and vice versa. The vibrating presser releases the work at a point when the needle is down, thus allowing the work to be readily turned upon the needle as a fulcrum. This can be used to good advantage in harness work and binding cloth or leather, as it moves simultaneously with the feed, thus preventing it from dragging upon the work and pushing the goods.

3d. An arrangement for guiding stays or bending automatically from a coil, thus obviating the necessity of guiding by hand.

4th. An arrangement for zigzag and ornamental stitching and overseaming.

5th. An adjustable shuttle-arm, by which the distance from the shuttle to the needle can be regulated.

6th. A reciprocating shuttle using a small loop, thus avoiding the wear on the thread consequent upon drawing a long loop back and forth through the material.

7th. In closing a tight seam with linen thread, thus effecting great saving to manufacturers.

8th. The use of a revolving shaft for driving needle bar, thereby enabling the machine to be run at a high rate of speed.

9th. The use of a wheel feed for leather work, which experience has shown to be superior to the step feed.

Not entered for competition.

230. The Wheeler & Wilson Sewing Machine Co. exhibited their well known family machine, a universal favorite for shirt manufacturing. Also their No. 6 machine, which we find to possess many ingenious and good features, among which are the device for taking up lost motion in needle and presser bars. They also exhibit some beautiful sample work. *Not entered for competition.*

271. Grover & Baker Sewing Machine Co. exhibited their two spool machine, or their well-known double thread, elastic, lock-stitch machine, which is capable of doing all kinds of sewing, and, from the peculiarity of its stitch is enabled to do embroidering without the aid of attachments. They exhibited some very beautiful samples of work done on this machine. They also exhibited a shuttle machine, together with an adjustable treadle, which can be regulated to suit various operators. *Not entered for competition.*

185. D. E. Rice. The Eliptic Machine. This is well-known as the standard family machine, and is capable of doing excellent family work, and runs with ease and noiselessly.

Not entered for competition.

186. D. E. Rice. The Monitor Shuttle Machine. This is one of those new machines that deserves more than ordinary notice and as it is not very extensively known, we submit the following, believing this machine to possess mechanical principles not exhibited in others of its class:

1st. The increase of power gained by the action of the levers on the needle bar, when the needle is entering the material.

2d. The improvement in tightening the needle bar with a gib and key which keeps the bar free from lost motion, which so often breaks the needles.

3d. The ease with which the feed is adjusted in a vertical position and the direct vertical and horizontal action of the feed which allows it a great range of work.

4th. Its simplicity and small cost of manufacture.

Not entered for competition.

493. D. S. Ewing. Wilcox & Gibbs Sewing Machine. This machine still continues to be a favorite as a family machine, and is still used very extensively in light manufacturing, as it has few wearing parts, runs noiselessly and more rapidly than any machine made. The revolving hook on this machine is a beautiful and very ingenious invention. *Not entered for competition.*

173. The Weed Sewing Machine Co. exhibited several machines, one of which had a stop motion that can be used to good advantage in manufacturing, as it stops the machine at will without injury or jar.

167. The Wilson S. M. Co. exhibited several very beautiful machines and a very handsome display of work, which was very much admired and for which they deserve great credit. They also exhibited a machine running by power, designed for manufacturing purposes, which they claim will run from 1000 to 1200 stitches per minute, which is very fast for a shuttle machine.

45. The Florence S. M. Co. exhibited their well-known family machine, with its reversible feed, which can be reversed while the machine is in motion. They also exhibited a new machine for family and manufacturing purposes, which has a novel movement for working the needle, which gives it a second dip by a device composed of a disc with two straight grooves crossing each other at right angles out of the centre of revolution. In each of said grooves is a sliding block, both of which are carried with a pitman attached to the needle bar. The revolving of this disc causes the blocks to give motion to the needle bar, alternately guiding and drawing. The device is durable, simple, direct in action and noiseless.

Not entered for competition.

240. O. F. Davis. The Remington Sewing Machine. The most prominent feature of this machine is the rotary controller for regulating the thread. It is a very good family machine and if used in manufacturing, can be run at a high rate of speed.

Not entered for competition.

338. The American Button Hole, Overseaming and Sewing Machine Co. exhibited several machines for general purposes. The most prominent features of their family machine are its peculiar shaped, self-threading shuttle; the bobbin being short and deep, all its parts are made in the most perfect manner and provision made for taking up wearing parts. They also exhibit the Combination Button Hole and Overseaming Machine, for plain sewing, overseaming and making button holes. This is like the family machine, with the exception of the button hole attachment, which consists of an under looper which passes up through the opening in the throat plate and carrying the under-thread, which is caught by the hook from a revolving sleeve on the needle-bar, which carries it around and under the needle, thereby forming the button hole stitch.

442. D. S. Ewing. The Secor Lock Stitch Shuttle Machine. This is a shuttle lock stitch machine, and is built in a very substantial and excellent manner, is light running, and uses either raw hide or steel rolls in the cams, and does very good work.

Not entered for competition.

871. The Independent S. M. Co. Independent Sewing Machine. This is a single thread machine, making the tambour or chain stitch, and can be run at a rapid speed.

Not entered for competition.

In concluding this report, your committee would say they have tried to do their full duty and have examined all articles in their class minutely, and we hope you may be enabled to say we have given satisfaction. We would therefore acknowledge the high honors conferred upon us, and retire from this committee feeling that we have done with pleasure the work assigned us. And in return we wish our thanks as a committee tendered to Mr. Knight and Mr. De Sauque for their kind attention and valuable services. Signed by the committee.

Lemuel B. Justice,
Wm. M. Smith,
C. B. Walker,
Wm. J. Tate,
Edmund D. Gilbert,

Committee.

CLASS No. 29–10.—Laundry Machinery.

The committee on the above division respectfully report that they have examined the following exhibits:

251. The American Machine Co. Crown Clothes Wringer. Find that the wringer is well adapted to its use, and fully performs all that the exhibitors claim for it, viz., it can, without alteration, be attached to a tub of any diameter, and by an arrangement of springs and levers peculiar to it, pass the thickest or thinnest articles of clothing through it and effectually wring them, and by the judicious proportioning of the roller shafts and elastic covering there is no risk of the covering becoming detached. *Bronze medal.*

537. Jas. Bing. R. A. Stratton's Mangle or Calender. For compactness, efficiency, cheapness and convenience of use, *Bronze medal.*

Chas. E. Ronaldson, M.E.,
S. Lloyd Wiegand,
C. Chabot,
Committee.

SUPPLEMENTARY REPORT.

368. R. H. Farley. Champion Steam Washer. The machine producing a rapid and effective circulation, *Bronze medal.*

1202. J. D. Brick. Electric Washing Machine.
Certificate of Honorable mention.

Chas. E. Ronaldson,
S. Lloyd Wiegand.

CLASS No. 29–11.—Paper Machinery.

11. Chas. J. Cohen. Machine for gumming and folding Envelopes. We have examined the machine for gumming and folding envelopes, and consider it to be a well-arranged machine and admirably adapted to the purpose, the work done being of the very best

quality; but having no other machine to examine, we are unable to speak of its comparative merits. *Bronze medal.*

171. Wm. H. Burkhardt & Co. Cedar Ship Tank. This tank is made of the best material, and shows most excellent workmanship. *Certificate of Honorable mention.*

172. Geo. J. Burkhardt & Co. Square and Round Cedar Tanks. *Certificate of Honorable mention.*

195. Brown & Carver. Paper Cutting Machines. From a careful examination of these machines we are satisfied that the general arrangement, particularly the appliances for holding the paper, and guiding the knife, together with the adjustment for the width of cut desired, entitle them to special mention. *Silver medal.*

1048. Brown & Carver. Hand Paper Cutter. Having the same general features, and entitled to the same mention. *Silver medal.*

480. Sellers Bros. Papermakers' Fourdrinier Wire Cloth. This is claimed by the makers to be the widest cloth ever made in the country, being 100 in. wide. In appearance it is fully up to the market standard. On account of its extraordinary width, *Certificate of Honorable mention.*

384. R. Mohler. Fourdrinier Wire Cloth. This is the finest wire cloth we have ever seen. The finish of the material and quality of the workmanship being of the highest order. *Silver medal.*

1228. Sellers Bros. Patent Dandy Roll.

1232. Sellers Bros. Papermakers' Cylinder.

These articles are superior to those heretofore in use, on account of the system of internal bracing, by which the whole surface of the cylinder is equally supported, giving increased strength with a great reduction in weight. 1228. *Silver medal.*
1232. *Silver medal.*

1229. Sellers Bros. Heavy Iron Wire Cloth. The exhibitors claim that this is the widest piece of heavy screening ever made in this country.

298. R. S. Menamin. Heston's Label Cutter. This machine is well calculated to meet the wants of a large class of consumers who need some means for cutting a small amount of labels with neatness and dispatch. *Bronze medal.*

1164. A. M. Gavit. Paper Testing Machine. This is a very convenient machine for the purpose.

Certificate of Honorable mention.

567. Julius Baumgartner. Seal Presses for Embossing. The committee were unable to examine these articles, they being carefully enclosed in a glass case.

427. Nelson Gavit. Patent Cone Pulley Paper Cutter. This is the best paper cutter known to the committee. It admits of working at higher speed than any other we have seen. *Silver medal.*

50. Chambers Bros. & Co. Fast Rotary News Folder.

51. Chambers Bros. & Co. 16-paged Folder and Paster.

52. Chambers Bros. & Co. Adjustable 8vo. and 12mo. Book Folder.

We have carefully examined these machines and the character of the work produced by them, and have also inquired of various publishers now using them in this city, who all speak of them in the highest terms. The introduction of these machines, particularly the folder and paster, has made a revolution in the production of pamphlets and periodicals. The sheets are folded and pasted at one operation, making work much superior to the hand process, both in accuracy and dispatch, the pasting being also more substantial than sewing. We suggest that these machines be referred to the Committee on Science and the Arts, for still higher awards.

50. *Silver medal.*
51. *Silver medal.*
52. *Silver medal.*

406. J. Morton Poole & Co. Machine Calender Rolls.

963. Gorton Gavit. Chilled Calender Rolls.

It is impossible from a superfieial examination of thc two stacks of calender rolls exhibited, to judge of the perfection of their surfaces, their absolute concentricity, their perfect parallelism, and their interchangcability. Both exhibitors intended to run the rolls at work (whieh would have made our task much easicr), but were prevented by the unequal settling of the floor throwing the frames out of adjustment. Poole's rolls are not numbered, and have been placed in the stack without regard to order. Gavit's rolls are conspieuously marked to place, and have a surface almost equal to Poole's. The only possible way left for us to judge impartially between the two stacks was to investigate the methods of manufacture adopted by the two parties. This wc have done. Both methods are patcnted, and both claim to be perfeet. We will allow that both will insurc perfect eoncentricity. In securing parallelism the methods adopted are widely different. Thcy both use an emery wheel on each side of the roll.

Gavit earries these wheels in swinging frames, the upper ends of which rest against, and are guided by a pattern plate or straight edge, placed above the roll to be ground, the lower ends of these frames are hung on pins, fixed in slides laterally adjustable on the carriage, whieh is guided by the ways of the bed. If, therefore, the ways of the bed, and the straight edge are both perfeetly straight and both exaetly parallel with the axis of the roll, a true cylinder would be produced.

In Poole's machine, the wheels are used in the same position as in Gavit's, but are held in adjustable slides, on a frame, freely suspended by rods from knife edges, this frame yields, if the pressurc on one wheel tends to beeome greater than on the other, so keeping an equal pressure on the two grinding wheels.

If the roll is eecentrie when first put in the machine, a slight friction is applied to this frame so as to resist the push of the high part of the roll, until the roll is ground perfeetly round, when this frietion is removed and the frame left free. It is then absolutely impossible to grind it out of parallelism as the wheels caliper it as they travel, independently of the accuracy of the bed or the skill of the workman.

This machine, then, is not a copying machine, but will originate perfect eylinders, independently of the original accuracy of the machine, or of the skill of the workman, nor, is the accuracy of the result affected by the wear, so that any number of perfect cylinders may be produced successively.

We would suggest that the consideration of this process of originating true cylinders, be brought before the Committee on Science and the Arts, as being a subject of great interest and importance to all manufacturers.

406. J. Morton Poole & Co. *Silver medal.*

So much of the above report as refers to the Grinding machine for Calender Rolls, is not advanced as authority, but is based upon the opinion and judgment of the three mechanical experts whose names are subscribed.

J. S. Bancroft,
Joseph Zentmayer,
Wm. H. Thorne,
as Experts.

Chas. Magarge,
S. A. Rudolph,
C. S. Garrett,
Joseph Zentmayer,
Wm. H. Thorne,
J. S. Bancroft,
Committee.

CLASS 29–12.—Rope Machinery.

No Exhibits.

CLASS No. 29–13.—Sugar Machinery and Chemical Apparatus.

We have examined, and herewith report upon the following machines:

162. Henry G. Morris. Centrifugal Machines. In reporting upon Henry G. Morris' exhibit of D. M. Weston's Centrifugal Machines, we confine ourselves to the improvements made by Mr. Morris since he has undertaken their manufacture, rather than the consideration of the particular merits of the machine itself, which has now been before the public for a number of years. This seems proper, in view of the fact that in the present exhibition, it comes in competition with no centrifugal machine of a different pattern or

make. Taken as a whole, the pair of Centrifugals suspended on their Mixer, with Green Sugar Elevator, and driving apparatus complete, enabling the refiner to establish his machines where he will, without preparing floors, or doing any millwright work for their reception, is certainly a useful improvement. By this method the machines and running-gear are readily fixed in proper line, and by the rigidity and strength of the entire construction, are kept so with certainty. The ease with which the line of centrifugals may be added to, or the position of all be changed to another part of the sugar house, are features recommending this plan of construction.

There are several original features presented in this display which especially commend themselves to our judgment, and reflect credit upon the exhibitor.

The three (3) wheeled Elevator for Green Sugar, so arranged that after the bucket discharges itself, it is carried backward by the third wheel, so that the bucket next to empty shall discharge itself entirely into the Mixer, and not partly on the line of buckets below, accomplishes the elevating of the sugar with a great degree of cleanliness and certainty.

The mounting of the Safety Cage on a frame in such a manner as will allow it to be inclined after the removal of a small foot-piece, greatly facilitates the work of taking down the machine in case of needed repair.

In the original method of using wooden blocks, held in a dish-shaped casting at the top of the spindle (as a brake for stopping the machine), it was necessary to take down the entire centrifugal when the wood required renewal. It was then carefully fitted in, and afterward put in a lathe and turned to a proper surface. Mr. Morris has made this dish casting octagonal, each plane surface of which is made to receive a piece of wood, properly shaped, which can readily be driven in while the machine is in place.

For the several improvements pointed out, adapting the Centrifugal Machine so admirably to the convenience of those who have need to use it. *Silver medal.*

484. Walker, Bros. & Co. Lightning Mill for Grinding Ores. We regard this mill novel in design, superior in construction, and effective in its work. *Silver medal.*

488. Walker, Bros. & Co. Farm Mill for Grinding Corn, Feed, etc. It is of good design, and well made, and is superior from the fact that all its grinding surfaces are readily renewable at small cost. Considering its capacity for work, and its strong construction, it is reasonable in price. *Certificate of Honorable mention.*

340. A. H. Searfoss. Vertical Portable Grinding Mill, and

92. W. L. Boyer & Bro. Farm Grist Mill.

Both, for Grinding Corn, Feed, etc., have been examined, but we find nothing in either of them deserving of special commendation.

342. Kreider, Zindgraf & Co. 30 inch Patent Portable French Burr Grain Mill is of good design, and has a stationary, noiseless feed. *Certificate of Honorable mention.*

343. Kreider, Zindgraf & Co. A 24 inch Patent Paint Mill with Mixer. *Certificate of Honorable mention.*

23. Hance Bros. & White. Drug Mills, and

70. Hance Bros. & White. Conical Plates for Drug Mills. We have examined, but we fail to find anything worthy of especial note.

55. Baugh & Son. Sectional Mills. Are strong and durable, and are well adapted for the purpose of grinding bone and phosphates. *Certificate of Honorable mention.*

179. W. H. & S. A. Slocumb. A Meat Cutter, Fruit Cleaner, and an Apple Parer and Corer combined. We find nothing in the Meat Cutter worthy of especial note. The Fruit Cleaner and the Apple Parer and Corer combined are both very effective in their operation. *Certificate of Honorable mention.*

1468. Geo. J. Burkhardt & Co. Improved Scotch Mashing Machine. Is a well designed labor-saving machine. We believe it to be effectual in its work. *Bronze medal.*

1469. Geo. J. Burkhardt & Co. Patent Discharge Valves, for the rapid emptying of Grain from Steep Tubs, Mash Tubs, etc. It is a convenient contrivance. *Certificate of Honorable mention.*

930. Thos. Mills & Bro. Excelsior Toy Machine for making Candy Toys.

931. Thos. Mills & Bro. Candy Cutting Machine.

Not entered for competition.

932. Thos. Mills & Bro. Improved Cocoanut Grating Machine.

933. Thos. Mills & Bro. Fruit Drop Machine.

Are all creditable, both in design and workmanship.

930 *Bronze medal.*
932 *Bronze medal.*
933 *Bronze medal.*

1431. Green & Platt. Improved Fire Extinguisher. A decided improvement over other machines of a like character. The security with which the acid is held in a glass vessel until the machine is needed for use, and the certainty with which it may be discharged, render it a very reliable machine. The peculiar arrangement of the glass acid chamber enabling the operator to refill it at pleasure, and discharge it without breaking, gives a convenient and durable apparatus. Fire extinguishing apparatus of this kind, remaining charged for long periods, and liable at any time to be handled, and moved about, cannot be relied upon for effective operation unless the chemicals are kept entirely apart until purposely mingled. In our opinion this safe keeping of the chemicals is very perfectly provided for in the machine under consideration.

Silver medal.

1432. Green & Platt. Babcock Fire Extinguisher, and

26. Philadelphia Fire Extinguishing Co. Gardiner's Triumph Extinguisher, present no features worthy of special commendation.

26. Philadelphia Fire Extinguishing Co. Gardiner Triumph Hook and Ladder Truck. A creditable exhibit.

Certificate of Honorable mention.

684. C. K. Bullock. Portable Grain Mill. This mill is very well made. It is entirely of iron, and the arrangement for adjusting the lower stone (which in this mill is the revolving one) is convenient and reliable. Its construction makes it convenient for transportation.

Certificate of Honorable mention.

76. David Stewart. Craeker Machine. Is an apparatus intended to imitate the handling given to the dough in the kneading of hand-made crackers. After passing through a system of annular cutters, forming the dough into long strips, it is eut into small pieces, each of which is given a quarter turn, and then plaeed under suitable stamps, whieh press the form of the eraeker.

It is elaimed, we think, with propriety, that the grain of the craeker is made in this way to resemble that seen in the hand-made artiele. The maehine works very perfectly, and with a minimum of labor uses twenty barrels of flour daily. *Silver medal.*

887. Jos. P. Miller. Coal Kiln Castings, consisting of one frame, two doors, and one grate have been examined, but do not call for any special reeommendation.

Rafael Estrada,
B. H. Bartol,
H. M. Howe,
Geo. R. Barker,

Committee.

CLASS No. 29–14.—Stone Machinery.

The undersigned being the only members of the Committee acting, report as follows:

They have made a very eareful examination of the workings of the two maehines, submitted for Brick making and close inquiry among those using bricks made by maehinery.

417. Excelsior Brick and Stone Co. Gregg's Exeelsior Briek-making Machine. *Silver medal.*

532. Sam'l P. Miller. Hand Briek Press. *Bronze medal.*

The Diamond Drill Stone Dressing Maehine, only very small model, eannot be judged of except by its work.

562. Penna. Diamond Drill Co. The Diamond Pointed Steam Drill. Deserves all that is said of it, its work is perfectly done, and is a great aid in mining, etc. *Silver medal.*

1370. Thos. J. Andrews. The Gold Washing Machine. We could not see in operation, and are unable to judge of its merits.

53. Chambers Bros. Brick Machine.

Certificate of Honorable mention.

Wm. Struthers,
A. Steinmetz,

Committee.

CLASS 29–15.—Gas Machinery.

The Committee of Judges on Class 29–15, on Machines, exhibited for carburetting or making Atmospheric Air Gas, report the following as the result of their examination and opinion.

Atmospheric air, has the power of absorbing and carrying on with it, certain quantities of the vapors of such hydro-carbon liquids, as boil at a very low temperature, the quantity being in proportion to its temperature, and where under favorable conditions, thus mechanically combined, the mixture constitutes an "Illuminent" exceedingly rich in its contents of carbon, the light being equal in quality to Cannel coal gas if burned near the machine; but on the contrary, if the air be cold, the hydro-carbon been used before, the vapor to be carried through the pipes for some distance, then, there will be very little gas produced and that of a poor quality. The vapors will be found condensed and carried back into reservoir or the drips.

The greater the quantity of oil evaporated by this machine, the greater the degree of cold created, and of course condensation in proportion. This is well illustrated in the evaporation principle of the "Ice Making Machines."

Illuminating Air Gas, in 1848, was in successful operation in London, England, but soon died out, owing to danger from its use. Nor would the insurance offices take risks where the illumination was from gas made by carburetting air with hydro-carbon oils; the oils then used there were obtained from coal gas tar, by fractional distillation, were called "Alliote,* Benzole, Heptylene." Benzone, the principal liquor used, had a boiling point about 176° Fahrenheit,

(* Now called Omogene.)

but carried with it more or less quantity of the much lighter article, together with some of the heavier liquid, "Heptylene."

The apparatus then used, differed in general very little in construction and operation from those in use at present in this country. "Mansfield's," for instance, consisted of three parts, viz:

"A force pump worked by a wound-up weight."

"A saturator (carburrettor) in which the liquor was put and maintained at a constant level."

"A gas holder, also, for storage."

The liquid also used in this country for carburetting is about the same specific gravity and known as "Gasoline" or "Benzole," which means about the same thing.

The boiling point of "Benzole" being 80° Centigrade, or 176° Fahrenheit, carries on with it at distillations, as in the former case, more or less of the lighter or of the heavier liquids. It is obtained from petroleum by fractional distillation.

Your committee desire it to be distinctly understood as their opinion that the vapor of all highly volatile hydro-carbon, as used for carburetting air, cannot be carried by gas pipes throughout a house and used as an Illuminent, without great danger.

It is very difficult to retain it, or prevent leakage through joints, stop-cocks, &c., being more penetrating than hydrogen alone. Leaks are difficult to detect from the odor being much less sensible to the smell than coal gas. It is heavier than coal gas and would therefore sooner reach a point of ignition at burners, &c.

The condensed liquor will dissolve gas fitter's cements, thereby soon cause pipes to leak at the joints. The most decided improvement made in carburetting is that of placing the entire apparatus in vaults under ground, in a place where if an accident should happen, no injury could be done.

146. Keystone Gas Co. Gas Machine. This machine is quite compact in structure; all the parts are enclosed in one cylindrical vessel, about one-fifth of which in length, is partitioned off, forming a chamber for the feed wheel to work in.

This wheel is nearly the diameter of the outside cylinder, and has arranged at equal distances around its periphery, "buckets," fixed so that, as the wheel is made to rotate, the buckets lift the gasoline from the bottom of the reservoir to top, and pour it into a duct, from which by gravity it descends and supplies the carburettors.

This bucket wheel is placed on the end of the centre shaft, and turned by it, said shaft extending through the partition, the larger chamber and the cylinder, and has placed on its out-end a pulley, which by gearing, and the gravity of a wound-up weight, gives motion, and rotates this shaft. A second cylinder of about half the diameter of the outer one is placed in the centre of the large chamber extending from the partition to the head, around to about one-half the circumference of this, and on its outer side is attached the carburettors, consisting of nests filled with a porous substance, such as cotton-wick or sponge.

In the centre of this second circular vessel is placed two fan or blower wheels, fixed upon the centre shaft; a small space being left all around these wheels, also between them. This inner cylinder is filled with water to a little above the shaft. The outside cylinder and wheel chamber is filled up nearly to the height of the shaft with gasoline; there are inlet and outlet pipes attached, and a sliding guage, by which the required quantity of gasoline can be regulated as required for the number of burners to be supplied.

The operation of the machine is thus: The weight being wound up and disengaged, the shaft and the wheels rotate. The feed wheel by means of its buckets carries up the gasoline from the bottom of reservoir, pours it down the conducting duct upon the porous material contained, which becomes saturated. The fan-wheel blowers are each divided into four compartments; over half the contents of which is submerged in the water; the other part is maintained full of atmospheric air by ducts entering at each end of the centre shaft and passing up through the water as the blowers rotate; the air is forced through a wide annular ring, on the outside of the contained cylinder, and on the opposite side to the carburettors; this blast of air in passing through the porous material contained in the carburettors, becomes charged with the vapor of the gasoline, which it carries to the burners.

This machine appears to be carefully designed and constructed in its arrangements and details with evident desire of providing against a concealed enemy. As a further security from danger, as well as to obtain a uniform temperature, the whole apparatus is placed in a vault.

288. Wm. Harkness. Steiner Gas Machine. This atmospheric air gas machine also consists of three principal parts. An air pump

or rotating blower working as usual in water, and operated by a wound-up weight with gearing, connected by a pipe to the hollow shaft of the carburetting cylinder, thence through the compartments of the carburettor, where it receives its saturation of "gasoline" vapor, then to the outlet pipe, and to the burners.

The carburettor consists of an outside cylinder (revolving), with a series of buckets attached on its inner circumference, turned by a chain band from a pulley on the shaft of the blower. The carburetting cells are stationary, and stuffed with a fine fibered vegetable material called "Excelsior." This cylinder is filled up to a certain height indicated by a gauge, by means of a pipe conveying the gasoline from the reservoir. As the cylinder rotates the buckets take up the gasoline from the bottom parts, and pouring it over the carburetting cells, where it is absorbed by the "Excelsior," and again given out in the form of vapor to the air forced through by means of the blower, the air passing into the centre of the cylindric carburettor, permeating the cells and excelsior.

The reservoir of gasoline is placed in a vault contiguous to the cellar in which the other parts are placed. Great care appears to have been used in design and construction of this apparatus, to secure safety and to prevent the escape of the gasoline vapor.

119. Rex & Bockius. Monitor Illuminating Gas Generator. This is an atmospheric air gas apparatus, and consists of a fan blower, carburettor, and gasoline reservoir, in three distinct parts.

The carburettor and reservoir are placed in a vault; the reservoir with its contents of liquid elevated considerably above the carburettor, so that the liquid supply from it to the carburettor may be maintained by gravity.

The carburettor case consists of a circular vessel or ring of large diameter in proportion to its height, resting on one end. The carburettor is placed inside of this, and it consists of numerous vertical channels of annular concentric rings filled with cotton wick or sponge. From it extends the supply pipe to the burner.

The gasoline is carried over and through these channels, fully saturating the porous material. The blower is of the rotating or fan kind, working in water placed in a contiguous apartment for convenient access, winding up, etc. It is supplied with atmospheric air

by a pipe from the outside, with a jack and gearing for winding up the weight; also, a pipe extends from it and connects with the carburettor, through which the atmospheric air is forced by the blower, thence through the various convolutions backward and forward towards the outlet pipe, and thence by the supply pipe, producing the requisite pressure, which is controlled by a regulator upon the top of the blower.

Much attention here again appears in providing against accident or escape of the vapor from any of the parts, and the whole apparatus is to be placed in a vault for greater security and for the advantage of uniform temperature.

610. A. W. Rand. Victor Gas Machine. The committee were unable to obtain any description of the interior arrangement or working of this machine before the time of giving in this report, their only guide being the small views and description given in Mr. Rand's business circular, excepting a few words with him when passing around the first time after our appointment, no person being found in attendance to explain or give information.

Externally this apparatus for carburetting atmospheric air has the same general appearance of parts as the others; consisting of a wheel blower, with a pressure air holder supported on its top; the carburettor case is a cylinder set on end and connected by a pipe with the blower; the carburettor to be placed in a vault with the pump in an adjoining cellar. The reservoir for the gasoline does not appear.

1521. American Meter Co. A Jet Photometer. The earliest type or first step towards the invention of this valuable instrument as it now stands improved, was made by Mr. Alcott, engineer of the Leeds Gas Co., in 1836. It then consisted only of a jet, pressure gauge, and governor to regulate the pressure. The principle of the invention was that with a certain pressure of a certain sized aperture in the burner, the length of the flame would determine the quality of the gas. This jet very soon became a favorite mode of determining the comparative value of coal gas, among the Scotch gas engineers, and called by them the "durability test," and was well known that the length of the flame issuing from a jet of a given aperture, will greatly vary according to the quality of the gas, the richer gas giving the longer flame, and the poor gas the reverse.

Dr. Fyfe made the earliest recorded observation on the comparative values of different gases, by determining the time which one cubic foot would supply a jet flame of a certain uniform height; and this durability test was one most relied upon by "gas engineers" in making comparisons.

George Lowe next improved the durability test by suggesting the method of testing the illuminating power of gas, by means of a jet burning from an aperture of known size, and issuing at a known pressure. The application of this principle he used in his office, to keep a check upon the quality of gas made at the gas works; by it he was enabled to ascertain any serious alterations in the quality of the gas generated during the whole day and night, instead of being confined in his observations to the time only when present at the works. The jet, in this form, was an Indicator of constant quality; not a light measurer.

After many experiments, extending over several years, he discovered that the jet he employed gave the same height of flame for the same quality of gas; the pressure being constant at six-tenths of an inch.

He then made a more delicately constructed instrument, with a standard gauge, for height of the flame at six inches; also the pressure at point of ignition was regulated by a very delicate King's gauge, to six-tenths of an inch, and magnified each one-tenth of an inch to about four times its natural size. The indications of the jet he compared, nearly at the same time, with the Bar photometer, upon the same gas, and thus established the value of a flame six inches high from the jet, to represent twelve sperm candles, when the gas was consumed on an Argand burner, at the rate of five feet per hour; and also found that when the gas rose to thirteen candles-power, his jet was just one-half inch longer than his gauge point; and again, if it fell to eleven candles-power, the jet was just one-half inch shorter. At this time, the instrument consisted of a governor to regulate the pressure; a jet, with a graduated scale, to read off the height of the jet flame; two pillars resting on an elevated base, and connected at top by a semicircular arch, divided into sixteen parts, and the parts sub-divided each into ten, representing tenths and hundredths of an inch; a pointer and counterpoise. The whole enclosed in a glass case, to protect the flame from air currents.

Messrs. Kirkham & Sugg were next associated with Mr. Lowe, in experimenting with this instrument, and the result of their combined labor, was the discovery of the fact, that the pressure scale, from four to seven-tenths of an inch, gave correct indications for common coal gas, for a jet flame seven inches high, and upon this discovery was based the principle of the Lowe's Jet Photometer, now so well known.

Two distinct and separate readings are required in each observation by the Lowe's jet photometer: 1st. The reading of the pressure, as indicated upon the dial scale by the pointer; but in order to obtain the candle-power, the observer was obliged to refer this reading to another scale, unattached to the instrument, whereon was given the diagonal resultant of two other scales: one, vertical, the other horizontal.

The next improvement on this instrument was made by Mr. Wm. W. Goodwin, of Philadelphia, about 1872, superseding the above diagonal scale.

This consists in the invention of, and placing upon the diameter of a semicircular dial plate, a horizontal scale showing the candle-power for a jet flame seven inches high, the graduations reading down to tenths of a candle, the scale extending from eleven to twenty-two candles.

To read the indications of this scale, radial directing lines, three of which represent one candle and one-tenth of a candle, are distinctly marked off on the dial, dividing that portion of the circular formed scale, extending from four to seven-tenths, into thirty-one parts. The candle-power having been calculated from this water-pressure. A very sensitive pressure gauge of large diameter has superseded the "Lowe" double ones, by the action of which a further magnified scale is obtained, so that one-hundredth part of an inch can be read off.

The succeeding and last improvement is that of the "American Meter Co.," now on exhibition, and consists in further improvements and simplicity. The water pressure of three-tenths of an inch is here again ascertained for a scale of the candle-power, extending from eleven to twenty-two, subdivided into tenths. This scale of candle-power is semicircular in form, marked on the face of the dial, so that the index needle at once points to the candle-power of the gas. The jet flame being at the height of seven inches, as in the others, no

second scale being here required. A small double gas holder or governor, peculiarly constructed, to obtain buoyancy and sensitiveness, and of comparatively large diameter, take the place of the small ones of the Lowe photometer; by means of this the pointer is carried over the scale, which is much magnified.

The Committee have some unsatisfied scruples that prevent deciding on the award for the merits of this improvement until satisfied of its reliability by comparing its indication with a Bar-photometer, when, if it prove a true measure of light, it will be a most desirable instrument for convenience, quickness, and readiness of observation.

We therefore respectfully recommend for it the award of the Silver Medal, on condition that its indications prove correct, and do therefore refer it for this decision, to the Committee on Science and the Arts of the Franklin Institute.

Silver medal conditionally awarded.

1143. American Meter Co. Hopper's Dry Meter. This meter is made on an improved principle, and designed to increase for its relative size, the quantity of gas to double that of the capacity of the ordinary dry meter. Thus reducing the unwieldy proportion and space occupied, as well as the cost of construction.

The action of the double diaphragm, operated by an ingenious parallel motion in the interior, and controlled by the single valve, is very steady and uniform, and they are so supported as to secure greater durability of leather, and much less liability of derangement in registration. *Bronze medal.*

29. American Meter Co. Glazed Dry Meters. Exhibited for display only. We are pleased to bear testimony to their neatness, beauty of design and workmanship.

1511. Harris, Guffrin & Co. Dry Gas Meters. Differing from the above in the construction of valve, its valve being longitudinal and reciprocating in its motion, insuring an even flow of gas and a steady and uniform light. The Committee commend the firm for neatness and beauty of workmanship in construction.

Certificate of Honorable mention.

472. Collins & Curl. Lacy's Automatic Gas Saver. Your Committee were very favorably impressed with the action of this

regulator. It was put to a very severe test: A flow of gas made to pass through a small gas holder provided for the purpose; the holder was loaded heavily until a high pressure was upon the burners; then the pressure reduced to five tenths of one inch, when under each of them it maintained a steady and unflickering light. For this improvement on the Automatic Gas Saver,

Certificate of Honorable mention.

916. Samuel J. Mervine, Jr. Gas Regulator, and Four-Way Stop Cock. This gas regulator works well under either a high or low pressure of the gas. The construction of the floating gas holder is new; also the Conical Valve. The valve consists of a long tapering tube perforated with holes, for admission of the gas into the top of the float or gas holder. The Stop Cock is a four-way cock, intended for the attachment of the regulator to the gas main, so that the gas may be passed through the regulator, or not, at pleasure. It allows the meter to be removed, etc., without disturbing the regulator; also the regulator to be taken away, and by a quarter turn of the cock, the aperture of the same stopped, while the supply of gas to the house is continued. The committee believe these to be new and useful improvements.

Certificate of Honorable mention.

1246. Adams & Stickney. Adams Gas Regulator. Your committee examined the operations of this regulator, but without any means of testing its quality, farther than the ordinary pressure of the gas; but believe it will prove satisfactory, when introduced by gas consumers.

161. Henry G. Morris. Morton Retort Lids and Mouth-pieces, with Holman's Fastenings. This construction of lid with the fastening is intended to obviate the trouble arising from the use of the old style lid, with loam and lime luting, which has been the custom for many years in coal gas works. The peculiar form of the edge of the lid and the finished flat surface on the mouth-piece, together with the sliding motion imparted to the lids in closing, is very favorable to the end proposed. They were but recently introduced into this country, and as yet have not been attached to "retorts" by many gas works. The end to be attained by the use of these lids is so desirable that the Committee decide to make a favorable notice of them.

Bronze medal.

Henry G. Morris. Dry By-passes of Centre Seal Valves. These valves were first introduced from England by the Southwark Foundry. The Dry Centre Seal has now, after twelve years trial, entirely superseded the Water Centre Seal.

The By-passes take the place of the old slide stop valves, as formerly used in combination, and are much less complicated, and more readily operated with these By-passes. It is impossible that any accident from mistake or carelessness when shutting off or changing the current of gas from or to any part of the works (as controlled by them) can occur, for one passage is never stopped until another is opened.

The Balance Valve Governor. These Governors have this peculiarity of construction, that the valve employed is a double poppet with seats precisely the same size, so that the valve is in perfect balance. This construction allows the use of a small holder and precludes the holding of the valve closed by any pressure in the holder. The old method was by a long cone or notched cup which was lifted by the holder, and so opened and closed the valve, and thus regulated the pressure.

The Governor exhibited would seem to present many advantages and to claim a favorable notice.

The Committee regret that other manufacturers of gas apparatus had nothing on exhibition, so as to enable them to make comparisons.

Thomas S. Stewart,
Samuel R. Brick,
Thomas R. Brown,

Committee.

CLASS No. 29–16.—Lubricating Oils and Engineers' Supplies.

The Committee on Lubricating Oils and Engineers' Supplies have had the various subjects assigned them under consideration, and have examined each item in regular order, giving to it all the attention the brief period allotted would permit. They have aimed to give a brief synopsis of the nature and utility of each of the improved productions, of the competitors for excellence in art, aided by

science. Each member has contributed his mite to the great repository of human advancement, by giving a written description of the competing article with which he was most familiar in every day life.

Lubrication, the humblest but most important agent in all the varied mechanic arts, is in its infancy. Vegetable and animal oils were till recently the lubricants in all the departments of industry. They tended to gum and oxydize the bearings, delay workmen, injure machinery, cause delay for repairs, and prevent the manufacturer from filling orders promptly. Cleaning up the rancid oil with cotton or woollen waste and stowing it away in some obscure place was the fruitful source of spontaneous combustion, often causing the labors of a lifetime to be swept away in a single night.

The discovery and development of the inexhaustible natural oil reservoirs on our continent came opportunely at the most critical period of our country's history; at a time its very existence seemed to depend on the resources of its varied manufactories, and they in turn were quivering in the balance.

Genius, industry and indomitable inventive talent labored successfully to refine, improve and concentrate the varied products of petroleum. Of the many manufacturers of great merit, only a few have presented the fruits of their scientific research and countless experiments for competition, at this exhibition of the Franklin Institute.

Petroleum in various forms and combinations with other oils is now used in most of the workshops and manufactories throughout the world. Machinery can be run without gumming or oxydizing the oil or corroding the bearings, in any climate. The improved lubricants of the last decade have economised time, added to the efficiency and durability of all kinds of machinery, and hence increased the productive wealth of the nation. But our present method is still deficient. The wastage is enormous. The analysis developing the best kind of oil without inflammable vapor, or the best combination of oils for the infinite variety of machinery, has yet to be made.

All liquids are, to a certain extent, lubricants, and are composed of millions of invisible round particles. These microscopic globes roll one over the other, like the grains of the finest sand, yet they have the power of attraction, cohesion and mutual interflowing one over, around and with the other, and of absolute resistance, so as not to be crushed, forming a lubricant.

All vegetable and animal oils contain glycerine combined with fatty acids; hence a chemical change is silently going on. In the course of time the acid is set free. The oil then absorbs the oxygen from the air, tending to corrode polished iron or steel, and turn copper or brass green.

---

487. E. F. Houghton & Co. Cosmo-Lubric Oil. Specific gravity, 28. Flashing point, 430°. Which they claim is made solely from petroleum, about five barrels distilled into one, which is a good substitute for natural sperm. We deem it of superior quality and eminently adapted to the heavy bearings of engines and other machinery. This company certainly deserve great praise for the scientific manner in which they have adapted the products of petroleum to the wants of man. *Bronze medal.*

658. Messrs. Morehouse, Rockafeller & Co. Paraffine Oil. This firm have made the largest and most beautiful display of choice samples of oil. They have on exhibition twenty-five varieties of oil, and three different kinds of Arctic axle grease. This company claims to be the original manufacturers of paraffine oil. The sample we examined of 25° gravity, for richness and beauty we have never seen surpassed. They also claim to be the sole manufacturers of the sperm arctic oil, designed by them to take the place of the natural sperm. They also have on exhibition, of their own manufacture, nine other kinds of excellent oil for lubricating various kinds of machinery. *Bronze medal.*

657. The Eclipse Lubricating Oil Company. A glass case containing six varieties of Lubricants. The neutral topaz oil is odorless, and assumes the characteristic of the animal or vegetable oil it has been combined with. It has the extraordinary merit of maintaining its fluidity at 10° below zero, and at a high temperature does not emit any combustible vapor. It is claimed that this hydrocarbon oil will dissolve and keep permanently in solution 10 per cent. more of stearine, margarine and glutinous matter of tallow oil than any other of a similar kind in market. There is much need of such a compounding oil as this claims to be. Woollen factories work under a serious disadvantage in cold weather, by the use of oil that will chill, causing the fibers to adhere, diminishing alike the quality and

the production of goods. For the efforts of this company in utilizing the mineral oil of Pennsylvania, *Bronze medal.*

1339. Messrs. Crew, Moore & Levick. Have on exhibition eleven varieties of Petroleum Oil, and make a highly creditable display. *Certificate of Honorable mention.*

1378. Geo. J. Faller. Excelsior Sewing Machine Oil. Samples of sewing machine oil not likely to gum or corrode bearings. *Certificate of Honorable mention.*

In concluding this hurried report on lubricants, we may add that petroleum has already become the most valuable branch of commerce. The yield for 1873 is estimated, including loss by fire and wastage, at upwards of five hundred millions of dollars. This natural oil adds more to the productive wealth of the country than either cotton, coal, iron, or gold. The adulterations of the higher grades of all kinds of oil are perhaps more numerous than in any other commodity. In tests, made a few months ago, a sample was obtained direct from the manufacturer, another sample of the same grade and make from a wholesale dealer and found to be adulterated. A retail dealer happened to be found who bought of the wholesale merchant and the sample obtained from him was found to be re-adulterated. Hence medals and prizes, without intelligence and careful examination by the user, are of but little public benefit.

863. Shepherd & Lloyd. Patent Tubular Iron Wheelbarrow. Admirably combined, strength, durability, and lightness, and is remarkably well balanced. It has a great advantage over wood—not being affected by the sun, hot ashes or castings. This is a step in the right direction. It aids and lightens the duties of the laborer, and economizes capital. *Certificate of Honorable mention.*

257. Conrad & Murray. Anti-Friction, or Babbitt Metal. The physical properties of alloys have nothing in their appearance to indicate their compound nature, and in many cases, the addition of a very small proportion of one metal greatly modifies certain properties of the others, such as fusibility, hardness, tenacity and the like; and, having no means of testing the samples on exhibition, can only report that they are fine specimens of Babbitt Metal.

1477. Philadelphia Smelting Co. Anti-Friction, or Babbitt Metal. Are creditable specimens.

289. Edw. Brown. Pyrometers. This instrument, invented by Gauntlett, of England, and improved by Edw. Brown, for which he has obtained letters patent of the United States, differs from others, and especially those having stone or clay "expanding rods," by the use of plumbago in a similar manner, and for the same purpose as the stone or clay. The use of plumbago is the subject of a patent. The pyrometer comes into action when the thermometer ceases to be effective; and a good instrument of this kind is a desideratum in the useful arts, for regulating the heat of furnaces, etc. It should be of easy application in the hands of workmen, prompt in its results, and exact in its indications. We can offer no opinion as to the value of this instrument, as there is no opportunity of testing its value by experiment.

290. Edw. Brown. Revolution Indicator. This instrument shows the number of turns made by a steam engine, per minute, by the height of a column of mercury, in a graduated glass tube; which stands in the centre of a three winged "flyer" in one of which is a reservoir of mercury, acted upon by centrifugal force, and causing it to rise in the glass tube. This instrument can be placed at an angle of 20° without affecting its action, more than two per cent. and can, therefore, be used on marine engines. It is not designed to take the place of the "Engine Counter," but is an important and useful contribution to the perfection and efficiency of our modern steam engines, enabling the engineer to ascertain at a glance the exact speed of his engine per minute. *Certificate of Honorable mention.*

962. Clark Bro. Pipe Tongs. This wrench is designed for grasping and turning round bolts, nuts, gas and water pipes, and other cylindrical objects, and can be readily adapted to any size of cylinder within the compass of three-eighths of an inch, by revolving the rivet which holds the two arms of the tongs together, and which is eccentric. They are well made.

865. Chas. Parham. Fine Machine Screws. For the fine and minute workmanship common to ordinary production.

Certificate of Honorable mention.

1216. Dunlap Gordon. Concrete Felt. This felt is designed for covering roofs of buildings and no doubt excludes the air as claimed, but can give no recommendations over many other roof coverings in use.

1126. John L. Mason. Tuyere. Invented by Wm. Weits. Appears to be a good tuyere.

1231. Sellers Bros. Soapstone Packing. The chief merit of this specimen is in the use of superior materials and manufacture, and is a good article of steam packing.

1031. Hidden & Hanmore. Hanmore's Patent Felting. Hair being an excellent non-conductor, it is desirable to use it on boilers, and pipes for engines, furnaces, etc., but its liability to destruction by crumbling and being converted into animal charcoal, when in contact with heated surfaces of boilers and pipes, renders its use unsuitable. To utilize hair is the subject of this patent. A plastic substance is used next the article to be covered, then hair, having been blended or matted into a compact texture, is applied by wrapping with wire netting. To secure it to its place it is further covered by a coating of wood, plastic, metal or canvass. This, in the judgment of the committee, is a useful and good non-conductor.

1470. H. W. Miller. Felt for Steam Boilers. Appears to be the matted hair, long known and in common use.

466. Jno. W. Tulley. A Paint Filler for Wood or Metal. The real object of painting is to protect wood, metals, stuccoes, etc., from being acted upon by the atmosphere, continued moisture and dryness heat and frost, causes oxydation and decomposition of wood. White lead is mostly used for preparing the surface of wood or metals, for the reception of paint, and ornamentation; but Mr. Tulley has discovered a mineral compound, for which he obtained letters patent in the United States, in 1870, which protects wood and iron, and is of sufficient elasticity to prevent cracking or peeling off. It can be applied with brush or trowel, filling the pores of the wood, and the inequalities of metal surfaces without stain, and when rubbed down with pumice stone, giving a uniform surface of great durability and hardness. The "filler" is a quick, firm dryer, and can be applied

with despatch and rubbed down in less time than most fillers; presenting a fine ground work for the reception of colors and varnishes, materially saving labor, time and paint. *Silver medal.*

BURNING OILS.

Few persons who have not made it a special study, have any conception of the extent of Philadelphia's trade in oils, and would our space permit, we would be glad to indulge in facts and figures to illustrate this point.

In no branch of trade has there been such a radical change, or so marked and important an improvement, within the past fifteen years, as in that which is the subject of this article.

In this revolution Philadelphia profited largely, assuming at once the leading place among the cities of the Union, in the manufacture and traffic in the valuable staple; which ascendency she still maintains. If he, who caused two blades of grass to grow where only one grew before, is worthy of being called a benefactor, certainly no less is he who by his skill, knowledge and science throws a safeguard around the fireside of the toiling millions. It is well that the struggle for supremacy in business circles prompts men of sagacity to turn their attention to activities which directly benefit humanity, and it certainly ought to be a matter of great satisfaction to be engaged in such enterprises.

We were led to the above reflections by our being called upon to examine into the merits of the different specimens of illuminating oils, on exhibition and competition at the Franklin Institute.

1321. Taber, Harbert & Co. Monument No. 1, Illuminating Oil. On inspection, we find this oil stands a fire test of 110° Fah.; Specific Gravity 46; Flashing Point 100°. It is free from the explosive substance known as benzine or naphtha, and also from dark colored elements or residuum, and is in consequence safe, beautiful in appearance, and free from offensive smell, it will not smoke or crust the wick, and will burn with great brilliancy. It appears to be a popular brand of oil with the entire trade, and is deserving to rank high as an 110° illuminating oil. *Bronze medal.*

1180. Wm. L. Elkins. Continental Burning Oil. On inspection we find this oil stands a fire test of 160° Fahr. It is the result of a recently improved process in manufacturing, in which the crude

petroleum is freed from its dangerous and explosive elements, and all impurities removed, leaving a pure crystal white kerosene oil. It is very brilliant in appearance, giving evidence of burning freely and with a bright clear flame, and not liable to create crust on the wick. We are pleased to feel an assurance in the manufacture of this oil, that a marked improvement has been made in the quality of refined petroleum distributed for sale throughout the country. With Continental Oil no family need have a dread of danger, nor will we hear so often of the heart sickening coal oil explosions that fill our public journals. *Bronze medal.*

1178. Wm. L. Elkins. Belmont Burning Oil. On inspection we find this oil stands a fire test of 100° Fahr. Specific gravity 46. Flashing point, 100°. This brand of oil received a medal at the Paris Exposition of 1867, which medal they still hold. Large quantities of this oil are shipped to southern markets. We find, as far as we are able to learn, that no accidents have occurred from the use of this oil, which is certainly a great recommendation.

Bronze medal.

1474. W. L. Elkins. Head-Light Oil. The oil stands a fire test of 175° Fahr. Gravity, 46 to 48. Flashing point, 160°. It is used on railroads, steamships, and in machine shops, is water white and odorless. Its high test insures it a perfectly safe and economical oil. *Bronze medal.*

399. Peter Schofield. Patent Gauge Cock. This cock, while being a novelty in the line of weighted gauge cocks, is open to some objections. In the matter of wear on the seat, it possesses merit from the fact that the weight always exerts its full force to keep the disc in its proper place, which in other weighted cocks is not always the case.

786. B. E. Lehman, Bethlehem, Pa. Ross's Patent Gauge Cock. This cock has the novelty of an arrangement by which, should the disc become worn and require renewing, the communication to the boiler can be closed, and the spindle carrying the disc removed, while steam is up. It is the only gauge cock, as far as we can learn, that has accomplished this desideratum.

Certificate of Honorable mention.

977. Edw. Schmidt. Steam Gauge. The distinguishing characteristic of this gauge is the shape of the flat brass spring, taking the place of the annular spring in the Bourdon patent, and the U-shaped pattern in Lane's improvement of the Bourdon. In this case, it is elliptical, the upper and lower sides of the ellipse being almost flat, but not enough to cause any sediment to collect in the closed ends. In registering high pressures, an advantage is claimed in introducing a steel spring within the brass tube, but this is liable to corrosion, an objection which must seriously deteriorate the correctness of the gauge in time. Outside of the improvement in the shape of the spring and fine appearance of the work on the gauge, we do not think it entitled to any special mention.

Certificate of Honorable mention.

1286. E. H. Ashcroft, Boston, Mass. Steam Gauges. Superiority in workmanship, and correctness and reliability in recording pressures, are the principal claims for these gauges. Lane's improvement on the Bourdon spring and the original Bourdon are both exhibited. A marked improvement is the arrangement of a buck-skin or gum packing gasket between the rim and body of the gauge, which, it is claimed, renders the interior air-tight, and therefore free from the liability of dampness, dust, etc., and preventing any chance of corrosion of the delicate working parts. The self-testing gauge is a novelty in gauge manufacture, which is entitled to special mention from the fact that by it the user at any and all times is enabled to readily ascertain the exact pressure on his boiler, and make any allowance in order to retain that pressure. This is accomplished by an arrangement of double dials, the inner one of which is the one to be used practically. Attached to every gauge is a small weight, and under the body, a hook, by which it may be suspended when it is desired to ascertain the exact pressure per square inch. The hook is attached to a lever, which is attached to the spring on which the pressure acts, reducing the action, as it were, to that of the common safety valve; the index dropping to the position which corresponds exactly to the pressure sustained by the lever and weight. Should the index with the weight suspended to the lever, point to the same pressure on the test dial, that it did on the other, the gauge is correct. Any deviation of the index shows the exact amount of the deviation of the elasticity of the spring. In support of the claim

for reliability and correctness, it is set forth that every gauge is separately tested by an open-top mercurial column. High pressures are registered by the above-mentioned gauges by means of increased thickness of the elliptical tube spring, and it is claimed that no limit has yet been reached, in pressure, beyond which it was impossible to construct a gauge to register them correctly. It is our opinion that as the self-testing gauge is an instrument for more faithfully registering boiler pressures than is done by the ordinary gauge, and thereby reducing the liability and frequency of explosions, as well as bringing said test under the immediate observation and supervision of steam users and owners, it is entitled to special mention as an improvement in the working of steam boilers.

Certificate of Honorable mention.

1483. Thos. Shaw. Open-Top Mercury Gauge. Claims the registering of high pressures by an open-top mercurial column. The fact that the open-top mercurial gauge is the only standard gauge and the only reliable one is to be conceded by every one, and as far as this applies to the above gauge the claim is correct.

1301. E. H. Ashcroft & Co. Boston, Mass. Exhibited by Henry Snyder & Co. Nickel-Seated Pop Safety Valve. The claims for this safety valve are: 1st, that of the non-corrosive nickel seat. 2d, a reliable lock-up valve which will raise at the instant the limit of pressure is reached, detaching itself from the seat, when the pressure has reached within three or four pounds of the limit. Inasmuch as the seat is non-corrosive, the valve possesses merit, but outside of this we fail to see any advantage over the ordinary spring valve. For locomotives or engines whose vibrations prevent the use of the lever valve, it is superior to the ordinary spring valve, because it will not "stick" The escape of the steam before the limit of pressure is reached is an additional advantage, inasmuch that it warns the engineer of the near approach of the "blowing off" point; further than this we do not think it worthy of any special mention.

Certificate of Honorable mention.

1039. Jos. Heginbotham. Swann's Patent Safety Valve. The claims for this valve are: 1st, that it can be used as an ordinary safety valve, working at any point below the pressure at which it is set. 2d, no more weight can be applied to it without blowing off

steam. 3 l, as a lock-up valve it cannot be tampered with, steam on or off. 4th, from the peculiar form of the valve it cannot "stick," and the full area is effective in discharging steam. 5th, as an ordinary and not a lock-up valve, the point at which it is set cannot be altered without taking the valve completely off the boiler. From actual inspection we fully sustain the claims above set forth, and are of the opinion that the valve deserves special mention as an appliance, which if in general use, would add greatly to the security of life and property, by preventing reckless and careless steam users from indulging in the habit of overloading safety valves.

In appearance it is like the ordinary valve, and therefore does not require any lengthy explanations to a new engineer. He can use it as any common valve, but by its construction, he is debarred from any attempt to carry more steam than his employer allows, and this is a point which has never been attained by any other lever valve.

The placing of any additional weight makes the steam blow off all the sooner. The shape of the valve, an ordinary disc resting on a flat instead of a bevelled seat, is an advantage, because of the full lift and area of the valve, and consequently a free flow of steam is given.

The objection to the use of springs in valves is overcome in this one, because its springs play only a secondary part, not positively regulating the escape of the steam, but acting only when an excess of weight is applied to the lever. Again it is enclosed in a chamber, and perfectly isolated from contact with steam or vapor, reducing the chances of corrosion, and is always of one temperature, that of the iron composing the chamber.

The alteration of the point of blowing off is easily accomplished by turning the back fulcrum to the right, if more pressure is required, and to the left, if the valve is to blow off sooner; the weight and lever having been previously removed. Unable to perceive any real disadvantages, and weighing well its many advantages, we reiterate our recommendation for special mention.

Certificate of Honorable mention.

665. Jno. A. Caldwell. Slide Valve Calculator. A diagram consisting of a series of concentric circles and diagonal lines, by which the lap, lead, positions of piston and crank, eccentric, point of cut-off,

etc., can be readily obtained by observation, when the travel of the valve and the stroke of piston is known. The claims of simplicity, adaptability and handiness are sustained.

It is a slight improvement on methods advanced by old authors, and would require considerable explanation to the ordinary mechanic, in order to make him fully understand its working and then he would not know the reason why.

955. Geo. Sumner. Steam Regulating Valve. A valve for regulating varying pressures, so that any required constant pressure is kept up independent of a high or low pressure in the boiler. The valve is applied to dye vats, drying cylinders, steaming chambers, or to anything where a steady temperature, and hence a constant pressure of steam is required. It is an arrangement of stationary and moveable cup valves, with an accompanying piston, to which is attached a lever like that of the common, safety valve. The position of the weight on the lever, regulates the pressure within, and being once set at that pressure, the valve is automatic in its action, whether the steam in the boiler be 100 pounds or 10 pounds. The reduced pressure varies less than half a pound.

For manufacturers, the value of whose products in many cases, depend on an even and constant temperature of working, be they dyers, refiners or chemists, this valve is a great improvement on old methods.

Certificate of Honorable mention.

419. Chapman Valve Manufacturing Co. Boston, Mass. The Chapman valve. Adapted for gas, steam and water. The claims for it are, a direct passage the full diameter of the pipe; a non-corrosive seat of Babbit metal, dove-tailed into the body of the valve, a tapered plug or gate kept free from rust, by the presence of the Babbit metal seat, and the non-liability of the valve becoming set fast from the dissimilarity of the metals composing the valve and seat. In regard to its being a straight way valve, the claim is just, because the plug is raised entirely from the line of pipe into a chamber above. To accomplish this, the plug is made hollow, which allows the steam to pass freely throughout its length. Guides on each side of the plug prevent its turning or coming in contact with the seat until the valve is closed. The dove-tailed seat is an advantage because it cannot, under ordinary circumstances, be detached from the body of the valve. The claim that the plug, when of iron, (as in water or gas valves) is

kept free from rust on account of the presence of the Babbitt metal seat, is in direct variance with the accepted theory of galvanism; that the presence of three elements, two metals and one fluid, superinduces an electric current, and hence chemical action, in which the positive metal must, in time, become deteriorated. Experience and time are required to test the truth or fallacy of this claim.

As the metal of the seat yields to pressure without injury, the interposition of sand or other hard substances, is less liable to occur than if the seat had been incompressible.

The metals forming the seat being dissimilar, it is conceded that there is less liability of cohesion between the parts. Its defects are few in number compared with the common valve, and although when used for steam there would be a probable disposition to cut the seat, the item of not requiring to be ground at intervals, is sufficient to bring it into use.

As a whole the valve possesses sufficient merit to justify our recommendation. *Certificate of Honorable mention.*

1366. Jas. S. Stewart. Stewart's Cylinder Lubricator. Theoretically, the idea advanced in this style of cup is a good one; a constant and regular supply being the only way by which economy in lubricants and a perfectly smooth action of the internal parts of the cylinder and steam chest can be obtained. In practice, however, we hardly think this cup meets the demand. The supply of oil is regulated by the lift of a valve in the interior of the cup, necessitating the closing of the lower valve, the removal of the cap and nut containing the regulating valve, and the replacing of the parts before any additional supply can be given to the cylinder. The passages are small and liable to become gummed up, and therefore there is a doubt of the valve working continuously. As far as sediment is concerned the arrangement by which the water from the condensed steam takes the place of the oil, is complete. Outside of these few advantages we do not deem it entitled to any special mention.

564. Davis & DuBois. The Davis & DuBois Combination Tallow Cup. This cup, consisting of two chambers, is of the ordinary globular form, and to all outward appearance is the same as the common lubricator. Passing through the centre, with a suitable

stuffing box at the top, is a hollow stem, the lower end of which engages with a seat at the bottom of the cup, and closing the communication to the cylinder, when it is desired to renew the supply of oil. A short distance above the lower end of the stem a shoulder engages with a seat on the under side of the globe, closing the communication between the upper and lower chambers. Near the top of the stem are two or more horizontal openings, which open a passage between the interior of the globe and the hollow stem; this passage being opened or closed at will, by means of a spindle valve, regulated by a hand wheel above the lever controlling the main stem. Its action is as follows: The lever being turned and the valve screwed down, so as to close the communication to the cylinder, the cup is filled with oil. The supply cock then being shut, the spindle valve is raised and communication is thus given between cylinder and cup through the hollow stem, when the action is just the same as a condensation cup (except that it has no poppet valves), using the oil regularly and economically. Should an extra supply of oil be necessary before starting, the main stem is turned half way round, and then with the spindle valve closed, it is reduced to the common cup, and has all its advantages. In addition to this, if when the cup is first filled, the main stem is raised so as to engage on the upper seat, all the oil in the lower chamber immediately finds its way to the cylinder, thus priming and preparing it for the reduced supply when the condensing combination is set in operation. By a cock on the bottom of the globe the water of condensation with the sediment is easily drawn off. We are of the opinion that this lubricator supplies a want long felt in the management of steam engines. By it oil in large or small quantities, under any and all circumstances, with or without steam, can be supplied to the interior of the cylinder and steam chest, and should an emergency require it, the whole contents of the cup can be injected with very little trouble. These advantages are attainable by no other form of cup, and it is our opinion that the idea is worthy of and fully deserves our endorsement. As an invention of very superior merit,

Bronze medal.

791. Wickersham & Bro. The Wickersham Cup. Adapted to line shafting, engine journals, and all positions where a steady and regular supply of oil is necessary. It possesses no radical difference

from ordinary wick cups, except in the graduated syphon, which in this case is woven on wire, and hence more readily introduced into the tube, and more readily cleaned when clogged with viscous matter from the oil. This is its only distinguishing merit.

Bronze medal.

33. Blake Hose Association. Hydraulic Hose.

190. Eckfeldt & Richie. Two sections of fire hose with pipe.

1040. R. D. Wood & Co. Street stop valve for water and gas.

1447. J. J. Allen & Son. Anti-Lamina for preventing and removing scales from boilers.

1469. G. J. Burkhardt. Grain Valves.

The awards under the above class have been made after careful and critical examination, and according to deserving and intrinsic merit, under the printed instructions to Judges, issued October 26th, 1874, by the President of the Institute.

J. B. Burleigh,
Barton H. Jenks,
A. F. Beam,
Frederick Schober.

Committee.

CLASS No. 30.—Musical Instruments.

The committee of Judges on Musical Instruments report that they have examined the following instruments on exhibition:—

Entry No.	Class No.		Manufacturers' No.
354.	3.	A Grand Concert Piano.	
1405.	20.	One Grand Piano,	10,607.
1408.	23.	One Square Piano,	10,694.
1406.	21.	One Upright Piano,	10,605.
66.	1.	One Square Piano,	10,391.
354.	4.	" " "	1,265.
402.	5.	" " "	702.
778.	11.	" " "	11,136.
1407.	22.	" " " ornamented,	10,800.

Entry No. Class No. Manufacturers' No

236. 2. Toy Piano and Mellophone.
491. 6. Chapel Organ.
569. 7. " "
1314. 13–16. Cabinet Organs, (Reeds).
641. 8. String Instruments.
769. 10. Quartet of Brass Instruments.
1344. 17. Organ Pipes.
1377. 18. Pneumatic Lever for Organ action.

The committee remark that little progress has been made in the improvement of pianos since the last exhibition, and that chiefly in the use of material, finish and profusion of ornaments.

354. 3. ALBRECHT & Co. Grand Concert Piano.

1405. 20. SCHOMACKER PIANO CO. Grand Piano.

A comparison of the two Grand Pianos, numbers 3 and 20, (by different makers) shows that No. 3 possesses a pure, even and melodious tone, greatly sought for, and that No. 20 is of superior power, and general finish.

These two pianos are so nearly of equal merit, and yet with dissimilar qualifications, that the Judges are unwilling to specify that either is wholly superior to the other, and think that they have equal claims for meritorious distinction. *See Supplementary Report.*

66. 1. SCHOMACKER PIANO CO. Square Piano. Of all the Square Pianos, No. 1 is unanimously declared to be the best instrument of that class in the exhibition, and worthy of special commendation. Square Piano No. 10,391. *Bronze medal.*

354. 4. ALBRECHT & Co. Square Piano, No. 1265.
Certificate of Honorable mention.

778. 11. ROSEWIG & STOLL. For A. M. McPhail & Co., Boston. Square Piano. (No. 11) possesses great purity of tone, but does not compare with No. 1 in other requisites. Square Piano No. 11,136. *Certificate of Honorable mention.*

402. 5. PEISTIN & BERWIN. Square Piano. (No 5) is constructed with a beveled back of the keyboard, so as to give greater freedom to the motion of the hands of the player. This piano has also improved capsules, and good touch. Square Piano No. 702.
Certificate of Honorable mention.

1406. 21. Schomacker Piano Co. Upright Piano. (No. 21) upright piano, compares favorably with other pianos of the same class known to the Judges, but as there is only this one in the exhibition, a comparison could not be had. This instrument, however, should be favorably noticed.

1407. 22. Schomacker Piano Co. A square piano, of which the exterior is highly ornamented and finished.

236. 2. Albert Schoenhut. Toy Pianos and Mellophone, (the sound produced by means of metalic plates) are well suited for children and beginners, being a useful substitute for "dummy" keyboards for practice, and are worthy as such.

Certificate of Honorable mention.

491. 6. Standbridge Bros. Chapel Organ.

569. 7. R. Nichols. Chapel Organ.

Nos. 6 and 7 Chapel organs, are so decidedly inferior to organs of the same class well known to the committee, that they are not considered as worthy of mention.

1314. 16. A. B. Felt & Co. For Horace Waters & Son., manufacturers, New York. Cabinet (reed) organ is constructed with full stops of reeds, the instrument is well made, and possesses merit above all the others exhibited. No. 31,960. *Bronze medal.*

641. 8. John Albert. (No. 8.) String instruments made by machine, finely finished. The method of manufacture having been inspected by members of the committee who visited the factory; well worthy of commendation and encouragement.

Bronze medal.

769. 10. Wm. F. Seifeldt. (No. 10) Quartet of Brass Instruments. Improvement in the valves, excellent and highly finished workmanship, worthy of particular notice. *Silver medal.*

1344. 17. T. J. Clark. (No. 17) Organ Pipes, deserve notice for their general finish, being superior to those usually made for the best church organs.

1377. 18. R. Nicholls. (No. 18) Pneumatic lever for organ action. No improvement.

In consequence of communications received by the Committee of Judges, with reference to the "actions" of the Grand Pianos, they have resolved to examine fully into the matter, and will make a special report with reference to them as soon as the facts can be elicited.

Respectfully submitted.

Jos. J. Mickley.
C. F. Stolte.
C. M. Cresson, M. D.
Wm. F. North.
Oscar Knipe.
Wm. C. Ewing.
John W. Nystrom.
Committee.

CLASS No. 30.—Supplementary Report.

At a meeting of the Committee of Judges of Musical Instruments, held upon November 7th, 1874, at the Exhibition hall, the following Resolution was unanimously adopted:—

That the Chairman be instructed to report to the Committee on Exhibitions that the major parts of the "actions" of the two Grand and Upright Pianos, are imported from Europe, ready for use, and that notwithstanding the Pianos of these classes on exhibition are of excellent tone and beautifully finished, they have been excluded from competition for premiums, because they are not wholly of American manufacture.

Jos. J. Mickley, *Chairman.*
Charles M. Cresson, *Secretary.*

491. Standbridge Bros. Chapel Organs.

569. R. Nicholls. Nonpareil Sunday school Organs.

922. E. M. Bruce & Co. Estey Cottage Organ.

1377. R. Nicholls. Pneumatic Lever for church organs.

The Committee having thoroughly examined the above exhibits, have to report that while they find the various displays very creditable, they do not find anything deserving of special mention.

Jos. J. Mickley, *Chairman.*

CLASS No. 31.—Paints, Colors, Varnishes, etc.

The undersigned, appointed by the Board of Managers of the Franklin Institute Exhibition, respectfully submit the following:—

965. Harrison, Brothers & Co. Case of Colors. This firm makes an imposing display, especially of Colors, (in competition) including White Lead, (dry and in oil); and also Chemicals. The articles of their own manufacture are numerous, and of great variety and beauty. We would call the attention of the Board of Managers of the Institute particularly to their Colors. These, for shade and quality, are the finest we have ever seen on exhibition, and without hesitation pronounce them superior in character. *Silver medal.*

964. Harrison, Brothers & Co. White Lead. As regards their White Lead (dry), which they also enter for competition, we would state that the relative merits of certain samples of this product, closely approximating, are by no means always easy to determine. The combined qualities desired are whiteness, body (opacity), and fineness (smoothness). The purity is readily ascertained by a chemical test, but a fair comparison would be a matter of time and experience with their use; hence the actual consumer (user), is the only reliable umpire, by whose decision we should abide. As far as a critical examination is concerned, conducted within the Exhibition building, we are at a loss to decide as to preference between their White Lead, and that of Wetherill & Brother, (also in competition). To say the least, they are both excellent and much alike.

668. Wetherill & Brother. Dry White Lead. White Lead ground in oil. See the remarks above, concerning their White Lead for competition.

1155. L. Martin & Co. Lampblack. This firm makes also a small display of a very important industry, which they conduct on an extensive scale.

The grades of Black of their manufacture, from ordinary Lampblack, (extensively used for general painting purposes), to Golden Spirit Black, (used for fine printing inks), are decidedly superior in merit. To the best of our knowledge, the higher grades, and especially the last-mentioned, are unsurpassed.

The patronage of the United States, English, French, Russian, and German Governments, for Golden Spirit Blacks, for the printing of bank notes, is sufficient indication of the merits claimed for them.

For intensity of color, body, fineness, "brilliancy," and the purity of the products which they exhibit. *Silver medal.*

612. Bihn & Co. Lampblack. The Lampblack of this establishment, for intensity of color, and other desirable properties, compares very favorably with that manufactured by L. Martin & Co. The only difference discernible is in a slightly larger amount of empyreumatic matter, which, for many purposes in the arts, is no objection whatever. The higher grades of black are also good. Although their collection is meagre, even beside that of Martin & Co.'s, yet the display for quality is certainly very creditable for a concern of such limited magnitude. *Bronze medal.*

460. John Lucas & Co. Imperial Pure Chemical Blue, and Soluble Washing Blue. The products of this firm, together with other articles which they exhibit, deserve mention; but, unfortunately, they neither enter for competition, nor offer goods for examination or comparison, which is to be regretted.

Not entered for competition.

The communications received from the respective exhibitors of Class No. 31 are herewith furnished for inspection.

We deem it proper to remark that the duty assigned us has been performed to the best of our ability, under the circumstances.

Jno. G. Craig.
W. M. Shoemaker.
Theo. D. Spear.
Wm. M. Carter.
Alex. Muckle.

Committee.

CLASS No. 32.—Paper Hangings.

Before proceeding with our report, we desire to state that as in our opinion, the highest medal should not be awarded for a mere display of various makes of papers, nor for the hanging of the same;

no matter how artistically done, we wish it to be understood, that the Bronze Medal should be accepted as the highest award in that class.

Your Judges having carefully examined the articles entered in class 32, report as follows:

82. Wilson & Fennimore. Manufacturers of ordinary paper hangings, exhibit many patterns in good taste, and claim excellence and cheapness in plain papers and illuminated borders.

273. Howell & Bourke make a display of machine made goods, especially in extension entries, and machine mouldings.

451. Howell & Bros. Wall Papers. Good designs, particularly in cheap papers, of which they have a large assortment of good quality, price being considered. *Bronze medal.*

554. Nagle, Cooke & Ewing. Wall Papers. A very fine selection of papers, (not their own make) and display great taste in the combination and hanging of the same, particularly in the Model Parlor. "To Nagle, Cooke & Ewing, for a fine selection of wall papers, and artistic taste in the combination and hanging of the same." *Bronze medal.*

555. A. Goth & Co. Oil painted Wall Papers. A decided advance in wall papering as regards durability and freedom from being affected by dampness, and while their designs and execution are quite equal to the best wall paintings in oil, the cost is materially less.

We also notice great beauty in their floral designs, which compare favorably with the best French papers. "To A. Goth & Co., for paper hangings in oil, and artistic designs of the same."

Silver medal.

159. C. J. Barlow. Some handsome combinations in the hanging of papers, and a patent window shade.

727. A. J. Miller. Exhibits some screens of descriptive paper hangings, for parlors, dining rooms, and Libraries.

H. W. Bartol.
T. W. Richards,
Jno. U. Walter,
Jno. C Browne,
Committee.

CLASS No. 33.—Philosophical, Mathematical and Optical Instruments.

The Judges on Philosophical, Mathematical and Optical Instruments, report:—

That the display was excellent, showing great progress over the last, on which some of the present committee were judges.

OPTICAL APPARATUS.

(Sub committee J. Gibbons Hunt, Geo. R. Morehouse, and C. M. Cresson, M. D.)

482. Joseph Zentmeyer. Microscopes and Objectives. The special points of superiority over all others of home manufacture, are perfection of mechanical work and finish.

The motions for focus, both coarse and fine, wear longer in perfect adjustment, than similar motions, made by any other maker, foreign or domestic. The fine adjustment, can be itself adjusted if necessary, a point of superiority not found in other instruments.

The circular rotating stage, has adjusting screws for perfect concentric revolution, a point not found in other instruments. The binocular prism is a fixture in the body of the microscope, and not moveable in the fine adjustment tube, like all others, thus securing a very important result, viz: coincidence of fields, the fine adjustment screw being in any position.

The straight tube which transmits the shorter ray, and therefore magnifies least, though only very slightly so, racks out somewhat faster than the other tube, and thus compensation in amplification between the right and left image, is obtained. Mr. Zentmeyer's lenses, the lower powers, up to one-fifth, have no superiors. His one and one-half inch is the best lens of that focus known to us.

His erecting prism, diaphragm, mechanical finger, the attachments for illuminations, are ingenious, and deserve highest praise. For Microscopes and Objectives, *Silver medal*

969. L. J. Marcey. Sciopticon, with two coal oil flames. This lantern originated with Mr. Marcey, and gives the best light in every respect, yet derived from oil. Portability, compactness, freedom from excessive heat, and that unusual peculiarity of precisely answering its intended purpose. *Silver medal.*

849. Albert G. Busby. Stereopticon. It is the most compact, and easily managed oxyhydrogen dissolving lantern. One box surmounts the other, but perfect ventilation is secured, and the lantern remains cool while working. The pressure gauges are simple and efficient, need never be taken apart, and will not spill their contents in traveling from place to place. The lime is made to rotate automatically, by placing the picture in the lantern. The condensers are plano-convex, the jets are a new pattern, which combination gives the flattest field and maximum illumination.

Silver medal.

1251. Queen & Co. Self-condensing Gas Cylinders.* They give the most easy and safest means of producing, condensing, and transporting gases for lantern uses. They are made of wrought iron, with cast iron cap, and are capable of sustaining a pressure of twenty times as great as the strain they are subjected to in gas making. The hydrogen cylinder is coated with vulcanized rubber, and is proof against the action of sulphuric acid. *Silver medal.*

SLIDES FOR LANTERNS.

1058. Casper W. Briggs. Transparent paintings on glass. His pictures have less opacity with greater transparency, than other analogous slides, and these qualities make them available for coal-oil lanterns, wherein maximum illumination is not claimed.

Bronze medal.

1273. T. A. Wilson & Co. Arundel Tinted Glasses for Spectacles. The peculiarity of the lenses is in the use of a glass, comprising a number of shades of one color, by which the manufacturers are enabled to produce a series of lenses, of which each has the same tint, although varying in thickness, and while the eye is protected, the glass is colorless to the wearer. The general workmanship is excellent. *Silver medal.*

1254. J. W. Queen & Co. Eaton direct vision Spectroscope. This is entirely new. By combination of thick plate glass with the ordinary prism, the dispersive power is increased more than three-

---

* *This apparatus, though extremely useful and convenient, is dangerous in unskilled hands.*

fold, and the ray is not deflected from its original path. While examining the optical combination, the Committee regrets to notice the defective mechanical construction and finish of the mounting.

Silver medal.

ELECTRICAL APPARATUS.

1052. GALVANO-FARADIC MF'G. CO., New York. Faradic Coils. Although well made, possess no novel feature.

1050. GALVANO-FARADIC MF'G. CO. Galvano-caustic Battery, after the Dresden pattern. This is portable, and when freshly charged, efficient for all surgical purposes. The fluid used is bichromate of potassa solution, with sulphuric acid. It soon becomes impaired in effect, which defect must be considered as an offset to the neatness and portability of the apparatus.

1051. GALVANO-FARADIC MF'G. CO. Galvano-therapeutic Apparatus. This has an interruptor which is automatic, and in the opinion of the Committee, entirely new and deserving of the highest commendation. It yields at will, exceedingly rapid or slow interruptions. It cannot yield less than two in a second, and slower breaks are often needed in treatment. This can be remedied by a simple hand break circuit wheel. It needs also an rheotrope, which can readily be applied. For the instrument displayed. *Silver medal.*

365. W. G. A. BONWILL. Electro-magnetic Mallet for plugging teeth. While the question of whether the method of plugging teeth by percussion is to be preferred to that by pressure is yet open, and no opinion is expressed by the Committee on the subject, yet the simplicity and ingenuity of this invention must commend it to all preferring the former method. *Silver medal.*

1255. AMERICAN DISTRICT TELEGRAPH CO. Burglar Alarm. This simple instrument signals whenever the circuit is broken, as by opening a guarded door or window. There is no battery in the house, nor is any alarm sprung in the building, an advantage in the case of nervous or sick persons. The station at a distance of three minutes time receives the alarm, and sends policemen. Should the house be "cut out" by a wire crossing those carrying the current, the instrument at once indicates the fact. *Silver medal.*

600. Thos. E. Cornish. Electric Burglar Alarms. Hotel annunciator. Call bells. Electric clocks. The burglar alarm is largely in use in and around this city. The principle is not new, except the application of a clock to throw out the alarm at the usual time of opening the house, so as not to disturb the family. For isolated houses it is of great value. While the Committee prefers the District alarm, as before stated, when the wires of the district service are available, it cordially commends this instrument. The other apparatus on deposit is of excellent workmanship. *Bronze medal.*

A similar alarm by Chester, Patrick & Co. is not in competition.

369. J. B. Shannon. Electro Magnetic Annunciator, for Hotels. Similar in principle to that in deposit No. 600, but differs in detail, especially as to the means of breaking the circuit, which are varied so as to suit the well known stupidity of many hotel guests. *Certificate of Honorable mention.*

1235. David R. Walker. Fire Alarm Telegraphic Apparatus. This by using a clock weight, dispenses with a local battery. It is also so constructed as to refuse to receive more than one simultaneous alarm from different stations, a contingency which has happened with the ordinary instrument. This from the confusion and consequent delay of apparatus service, has caused, and may in the future cause increased damage by fire. It may be said to be the best instrument of its class in use. *Silver medal.*

1204. W. J. Philips. Printing Telegraphic Instrument. A modification of the well known dial instrument. It is a simple and rapid worker, combining bell, dial and printed signals. Either method may be used singly or combined. *Bronze medal.*

1205. Elisha W. Andrews. Improved Lockwood Battery. This is a Callaud modification of Daniell's cell, with a horizontal porous cell. It will doubtless prove constant and efficient, but needs further trial.

1206. W. Hochhauser. Improved Morse Register. This has an ingenious self starting and stopping arrangement. *Certificate of Honorable mention.*

1174. J. P. Friez. Relay, Switch and Sounder. The instruments present several new features. The committee recommend its examination through the Committee on Science and the Arts, by practical telegraph operators.

1207. L. G. Tillotson. Telegraph Instruments.

1296. Partrick, Burnell & Co. Telegraph Sounders.

1297. Partrick, Burnell & Co. Champion Learners' Instrument.

1298. Partrick, Burnell & Co. Relay Magnet.

In the absence of any formal communication to the committee as to points of superiority claimed, no award is suggested. The instruments are of excellent make and finish.

1284. E. T. Phillips. Patent Covered Telegraph Wire. The committee was unable, owing to the pressure of work, to make tests as to the insulating power and durability of the wire, in comparison with the others now in use for office work. The question of superiority is referred to the Committee on Science and the Arts.

1329. C. J. Frost. Electric Fire Detector. Is designed to signal by the expansion of rarefied air. The idea of thus signalling by the physical effects of heat, is old, and has never been satisfactorily employed in practice.

366. J. D. Rice. Lightning Rods, Wind Vanes, &c.

643. Rayburn, Hunter & Co. Lightning Rods.

741. J. C. Bryan. Magneto-Electric Lightning Rod, &c.

There is nothing that is new that can be commended. The use of magnetic points, and hollow points and rods, has long since been shown to be unworthy of commendation, both in discussion in the Committee of the Science and the Arts, and by the Institute at its meetings. The solid copper point, with surrounding wire points imbedded in zinc, after the late Professor Hare's method, with the copwire rope, known as the Gatchell rod, and now deposited by Mr. D. Rice, was favorably reported on by the Committee on Science

and the Arts, twenty years ago. It is regarded as the best on exhibition, always supposing the existence of a proper ground connection.

1152. Becker & Son. Balance of precision for Scientific use. The balances of Messrs. Becker are too well known to require comment. *Silver medal.*

497. Shive Governor Co. Shive's Watchman's Clock. A simple, cheap, and effective device. A disc of card board marked with the hours and sub-divisions, revolves on the shaft of the hour-hand; a hole drilled in the face of the clock, allows of the introduction of a sharp pencil-point to mark the disc at stated times. As the key of the case is in the care of the proprietor, tampering is impossible. *Bronze medal.*

1410. Stevens Institute of Technology, Hoboken, N. J. Thurston's testing machine, with automatic record. Referred to the Committee on Science and the Arts.

127. Heller & Brightly. Surveying and Engineering Instruments.

829. W. J. Young & Sons. Engineering Instruments. These were referred to Dr. C. M. Cresson, as a sub-committee, he being the only member practically acquainted with field-work. His report is as follows:—

"I have examined the Surveying Instruments on exhibition, and find them to be of creditable workmanship. The mechanical execution of those of Messrs. Heller & Brightly, the best. For practical operations and field work, I think that the instruments exhibited by Messrs. W. J. Young & Sons will prove most serviceable. The system of cast plates with ribs, as made by Messrs. Heller & Brightly, is liable to the objection of want of uniform density, and lack of hardness, and ability to resist the effects of partial expansion and wear and tear, that the rolled and hammered plates of the Messrs. Young & Sons possess. So that whilst the lighter and neater instrument of Messrs. Heller & Brightly would be preferred by many, I should select those of the Messrs. Young & Sons as the most useful and practical.

"The matter of magnifying power is one not properly to be considered as peculiar to the instruments of Messrs. Heller & Brightly, because any maker can so construct his telescope as to obtain it. I think that the Odometer and Micrometer of Prof. Lesley, made by Messrs. Heller & Brightly, should be noticed; and that the ordinary leveling and transit instruments of both makers are worthy of commendation.

"The Gradientor of Messrs. Young & Sons is a novel and useful appliance, and is worthy of a second premium."

127. Heller & Brightly. For the Solar Transit.
Silver medal.

829. W. J. Young & Sons. Coast Surveying Instruments.
Silver medal.

B. Howard Rand, M. D.
J. G. Hunt, M. D.
Geo. R. Morehouse, M. D.
J. Solis Cohen, M. D.
E. Otis Kendall.
Chas. M. Cresson, M. D.
E. Thomson.
H. C. Wood, Jr.
Committee.

CLASS No. 34.—Printing and Typography.

The Judges appointed to examine the articles in Class No. 34 respectfully report:

295. Robert. S. Menamin. Well squared and substantial Iron Chases, for letter press printing. *Certificate of Honorable mention.*

296. Same Depositor. An improved and patented "Brass Galley," for types, of superior strength and finish. *Bronze medal.*

297. Same Depositor. "Bronstrup" Lithographic Hand Press.
Bronze medal.

329. Times Printing House. For tasteful display of specimens of Ornamental Letter Press Printing.
Certificate of Honorable mention.

659. JOHN T. GRAHAM & Co. Sholes & Glidden's "Type Writer." *Silver medal.*

910. J. W. DAUGHADAY & Co. Printing Press. A small type Printing Press styled "The Model Printing Press," adapted to cheap cards, small labels, etc. *Certificate of Honorable mention.*

1131. ROSE & NEILL. A patented composition for printers' rollers.

1427. MELLOR & RITTENHOUSE. Composition for Printers' Rollers, compounded of Glue and Glycerine, and not patented. *Bronze medal.*

1244. ROWLEY & CHEW. Specimens of Wood-Block Printing. *Certificate of Honorable mention.*

1450. S. P. FERREE. Specimens of parti-colored Printing, executed upon the "Five-Color Chromotype Cylinder Printing Press." The machines are not on exhibition, but the samples evince decided improvement in speed of production applicable to large quantities of such work. *Certificate of Honorable mention.*

463. THE BULLOCK PRINTING PRESS COMPANY. Self-feeding Perfecting Press. This machine was invented by the late William Bullock, who lost his life in the completion of the press. It is now manufactured for the Company by Messrs. I. P. Morris & Co., of this city, whose excellence of workmanship is worthy of the invention. It is a newspaper printing press, embracing an economy of space, power, time, and attendance never before united for the purpose. These machines are now in use in various parts of the world. *Silver medal.*

The Judges recommend for this invention the Elliott Cresson Gold Medal, and invite the attention of the Committee on Science and the Arts thereto accordingly.

508. REX & BOCKIUS. Small Type Printing Press, styled, "The Gem Self-Inking Printing Press." Apparently designed for non-professional use. *Bronze medal.*

1094. E. V. HAUGHWOUT & Co. "The Universal Printing Press," two sizes. This invention is one of the ingenious Job

Printing Machines produced within a few years, and avoids several defects of its predecessors. We certainly know of none better.

Silver medal.

176. TAYLOR & SMITH. Color Printing. This firm presents specimens of Color Printing from Types, Plates, Wood Cuts, and Lithographic Slabs. *Bronze medal.*

1515. Same Depositors. Photo-Lithographing and Engraving on wood or metal, and of original scenic drawings. *Bronze medal.*

372. GRAF BROTHERS. Improved Autographic Transferable Ink. For an improved autographic Transferable Ink whereby autographic circulars may be executed from and upon any description of writing paper. *Bronze medal.*

A. HART.
HECTOR ORR.
E. R. COPE.
Committee.

CLASS No. 35.—SADDLERY, HARNESS, TRUNKS AND WHIPS.

Your committee appointed to examine "exhibits in Class No. 35," beg leave to report:

566. S. R. PHILLIPS. Harness.

A. A set of fine and light Double Harness.
B. Sets of heavy Double harness.
C. Ladies' and Gentlemen's Saddle.
D. Life sized Horses.

A. Is decidedly the finest set in the exhibition, both as to workmanship and material; in this set there is a change from the old style of buckle and billets for driving lines which, although apparently trifling, is worthy of notice; that is the driving lines attach to the bit by a steel hook, handsomely enclosed in the leather which extends back beyond the steel buckles into a half inch buckle, making a very neat and safe attachment; this set, with

B. Heavy double harness, and

C. Ladies' and Gentlemen's saddle, also of fine materials and handsome workmanship, together with the life sized horses D, make a highly attractive display, and are worthy of the most honorable mention. For harness (single and double,) *Bronze medal.*

579. Watt & Kennedy. Trunks for Mercantile Purposes, with two others. That for mercantile purposes has extra heavy clamps rivetted on heavy burs inside, and extra quality hoop iron around the edges; the handles are iron plated on inside to keep them in shape, with outside strips of hickory and flannel lined tray. From the shape of the heavy clamps and their position, it is quite impossible for any part of the trunk to touch the floor. It is made powerfully strong, even to the defiance, apparently of the most experienced "Baggage smasher."

One of the others has a tray fitting in the top which, by a small catch in front may be either carried up in its place in the lid, or left down, as convenience may require. This is an improvement.

The third, a fair leather trunk is of sterling material and excellent workmanship. *Bronze medal.*

102. S. H. Allen. Fine Harness Ornaments. A fine display of handsomely finished ornaments.

Certificate of Honorable mention.

304. A. Reiss. Set of Silver Mounted Single Harness. Well made and of good material.

804. A. S. Jenks. Hine's Patent Driving Bit and Horse Shoes. The merit claimed for this bit is safety and relief from labor in driving what are termed "pullers." One of your committee tested this bit upon a "puller," and his statement, in which we concur is, that with the "Hine bit" properly adjusted in the bars to suit the horse's mouth, you may sit behind a horse in perfect ease, that would, with an ordinary straight bar or snaffle, compel you to "work your passage," and for the very large majority of horses that "go the road," and make trouble by pulling, a change to this bit would be for the very great relief of drivers, as well as safety to all others concerned. This is a good bit for coach horses and all others not intended to be driven to "speed," as also, when made lighter, for "saddle horses."

Silver medal.

The horse shoes on exhibition, are, with one exception, very light and handsomely made track shoes. The exception is an ordinary medium weight shoe, direct from the anvil, and showing a very superior hammer-dressed job.

1419. A. Lynch. Set of Single and Double Harness. All of good stock and very creditably made, mounted and finished. There is economy in using this character of harness. It is made to wear.

Certificate of Honorable mention.

1304. Boland Bros. Wood Hames. Good shape, well ironed, and with highly commendable tugs and swivels.

Certificate of Honorable mention.

Respectfully submitted,

Geo. Sturges.
John Kelsh.

Committee.

CLASS No. 36.—Safes, Bank Locks, and Scales.

1263. Riehle Bros. Rail Road Track Scale. We have examined the four-section rail road track scale exhibited by this firm. In this scale the main levers are each hung by two links from a chair, so constructed, as to allow the lever some play in all directions; these links having self-adjusting blocks for the pivots to rest on, to insure equal bearing over the whole knife-edge. The long arms of the levers are connected in pairs, by means of links and self-adjusting blocks, with a central vertical lever, like a bell crank. These vertical levers are connected together by rods, provided with swivels for adjustment, and rocking-blocks for the pivots.

The platform is prevented from swinging far enough to move the pivots by check-rods, which are attached to the central chairs.

The last vertical lever is made with a long horizontal arm, to which is coupled an intermediate lever which conveys the motion to the weighing beam. In the double weighing beam on this scale the two beams are hung on separate pivots, but we were unable to see any advantage in this mode of construction over the ordinary solid beam with two separate poises.

This scale is very compact, apparently well made, and stood the tests made by your committee well.

1191. Moore & Mixsell. The Howe Rail Road Track Scale. The main levers in this scale, are formed on the ends of a tubular

shaft, which, by means of a vertical arm, transmits the motion through connecting rods to bell-crank levers as in the scale of Riehle Bros. By this arrangement, the pivots, necessary to connect the main levers with the vertical ones, are dispensed with, causing a corresponding decrease of friction. The main levers rest on chairs, provided with rocking or adjustible blocks, to equalize the bearing on the pivot. The casting, resting on the second pivot, is made with two dish-shaped cavities in its upper face, in which are placed two chilled iron balls. On these balls rests a plate similarly shaped and fastened to the under side of the platform, which is thus left free to roll in all directions without causing any movement on the pivots. The shape of these cavities always ensures the platform returning to its place, thus dispensing with cheek-rods. The knife edges or pivots are supported over their whole length and can therefore be made much longer than when the steel pivot has to take the whole strain without support. These pivots rest on chilled iron instead of hardened steel. For knife edges, *Bronze medal.*

317. Fairbanks & Ewing. The Fairbanks Rail Road Track Scale. In this scale the main levers are each hung by a link and clevis from chairs, so as to allow free vibration in all directions. The long arms of these levers are connected by links to a system of central horizontal levers which convey the motion to the weigh beam.

The opposite main chairs are connected together by a transverse wrought iron frame, so that the levers in each section will retain their relative position, should any unequal settling take place. The platform is prevented from swinging far enough to move the pivots, by means of cheek-rods which are attached to the central chairs, so that unequal settling cannot cramp the action of the levers. In this scale, the transmitting strains are all in vertical lines, hence there is no tendency to shift the relative position of any part of the scale. The pivots rest, throughout, on polished faces of hardened steel. The accuracy of this scale was tested in the same manner as the others, by a uniform load placed alternately over the fulcrums and attachments of each section, the weigh beam indicating the same weight in the several positions of the load with great uniformity.

Your committee are of the opinion that the Fairbanks scales are decidedly superior in accuracy and durability for the following reasons:—

1st. The arrangement of levers and bearings as described.

2d. The use of freely suspended links and clevises instead of rocking blocks.

3d. The uniform method of manufacture, together with the excellent work and finish on all working parts of the scale.

4th. The facilities given for repairing, by making all parts of the scale to standard guages, and therefore interchangeable.

Silver medal.

1264. Riehle Bros. Wagon Scales. Riehle Bros. have a very convenient window beam for this scale, having the graduations and figures on top, so they can be plainly seen. This is a good arrangement. *Bronze medal.*

1190. Moore & Mixsell. Howe's Hay Scale.

318. Fairbanks & Ewing. Fairbanks' Hay or Coal Scale. The platform is suspended from castings bolted to the corners of frame around the pit, to which castings the check-rods are also attached, so that unequal settling cannot cramp the levers or platform. The long ends of the levers transmit the strain through pointed pivots; and, with the two long levers, these points are in one vertical line, so that unequal loading of the platform has no tendency to twist or cramp the action of the levers.

We consider the Fairbanks' hay scale to be superior, for the same reasons that were given for the track scale. *Silver medal.*

Furnace Charging Scales. There are no important points in the levers and platforms of these scales, to which the remarks already made will not apply in regard to their weighing or graduated beams.

1287. Fairbanks & Ewing. Fairbanks' Furnace Charging Scale uses a solid beam, containing a number of small slides, on which the poises are clamped, and the one to be used is drawn out against a stop adjusted to the desired weight.

1188. Moore & Mixsell. The Howe Charging Scale has a beam made of a number of parallel horizontal bars, on each of which is clamped a poise, having a hook hanging from it; a weight is hung to the hook on whichever beam it is desired to use.

1267. Riehle Bros.' Charging Scale has a main beam from which a frame is hung, having knife edges at intervals, on which secondary beams rest when required. When not in use, they are held up by latches. The action is nearly the same as that of the double beam on their track scale, having two additional pivots. This arrangement seems to be more convenient, and, if the additional pivots do not introduce too much friction, is preferable and deserving of mention. *Silver medal.*

1189. Moore & Mixsell. Howe Dormant Scale.

316. Fairbanks & Ewing. Fairbanks Dormant Scale.

The superiority of the Fairbanks scale is apparent here, as in the others above described; though, in this style, all makers use the suspended platform, the difference being in arrangement of check rods, as between Riehle and Fairbanks, and the use of chilled iron balls by Howe.

1187. Moore & Mixsell. Howe Portable Scales. These scales being generally used on irregular surfaces, as uneven floors, &c., your committee thought best to test them by placing a piece of metal $\frac{1}{2}$ inch thick, under one wheel, and then loading the platform on the corners, so as to bring all four wheels to a bearing on the floor, by springing the frame of the scale. This amount ($\frac{1}{2}$ inch) is probably in excess of what would ever occur in practice. Howe's scale, and also Fairbanks', stood this test without any perceptible difference.

1186. Moore & Mixsell. Howe Drop Lever Scales. A new arrangement. Instead of dropping the fulcrum of the weigh-beam, thus lowering the platform on to the frame, as has been customary; they, by means of levers arranged for the purpose, lift the platform upon four pins away from the pivots, which pivots are not moved in the least. This is far preferable to the old system, (which causes considerable scraping of the pivots). *Bronze medal.*

With reference to small "Counter," "Grocers," "Union," "Even Balance" scales etc., we have not noticed any great difference in design between the various exhibits, but we are satisfied that the materials and system of manufacture used by Fairbanks, should entitle him to the preference, as ensuring greater accuracy and durability.

In all of Fairbanks' scales, the workmanship and finish are of the

best character; and in many, particularly the heavy scales, the designs show careful consideration of the forms best calculated to stand the strains to which they are subjected in use.

507. Henry Troemner. Small Scales and Balances. This is a fine collection of well finished counter and small scales, together with fine balances for accurate weighing, intended for chemical and assaying purposes. The fine balances are well made, handsomely finished, and very accurate in their operation. *Silver medal.*

496. Shive Governor Co. Buoy's Counter Scale.

650. Farrell, Herring & Co. Fire and Burglar Proof Safes.

905. American Steam Safe Co. Steam Safes.

In regard to fire and burgular proof safes, we can do little more than refer to the two exhibits.

They each claim absolute protection, and refer to long lists of fires and tests, where they came out uninjured, and to many unsuccessful attempts to enter the safes by violence.

Your committee, not having practical knowledge of the successes claimed by either party, are nevertheless of the opinion that Farrell, Herring & Co.'s safes are worthy of the highest award, on account of having, in addition to the combination of iron and hardened steel plates used by the other makers, a backing of Franklinite, which, it is claimed, cannot be entered by the use of the blow pipe and drill.

To No. 650, *Silver medal.*

758. T. H. Aurocker exhibits Locks which he claims are both powder and burglar proof. They are apparently good key-locks, without any especially new features.

1046. The Worral Bank Lock Co. Bank Locks. A combination lock, which they claim is perfectly secure that it cannot be picked or forced open. In proof of this, they refer to the fact, that Mr. Jas. Sargent, an expert, made an attempt to pick it at the exhibition of the American Institute, in New York, for a reward of $2,000, and failed to open it, after a trial of 21 days.

We would suggest that the consideration of this Lock, be referred to the Committee on "Science and the Arts," as our time has been too limited to fully examine it.

17. Yale Lock Co. Bank Locks.

1266. Riehle Bros. Testing Machines.

1410. Stevens Institute of Technology, Hoboken, N. J. Prof. Thurston's Testing Machine, exhibited by Henry Morton, President. This machine has been fully described in the Journal of the Institute, and we would recommend that it be referred to the Committee on "Science and the Arts" for a more complete examination.

200. Stewart, Marks, Ralph & Co. Packing and Weighing Machine. This is intended for packing powders into cans or packages, for druggists and grocers use. It can be adjusted to pack a fixed amount in each package. Is rapid and accurate in operation, and can be worked by unskilled labor.

Certificate of Honorable mention.

J. S. Bancroft,
A. W. Vancleve,
Wm. H. Thorne,
T. R. Peale,

Committee.

CLASS No. 37.—School Furniture and Educational Appliances.

The judges appointed to examine the exhibits of School Furniture and Educational Appliances, Class No. 37, and to report the merits of such articles of that class as were entered for competition, have the honor to make the following recommendations:

409. John L. Smith. Map Case, with Maps on Spring Rollers. We are of the opinion that wall maps on spring rollers, attached to this case, are more easily handled, better protected, and that they occupy much less space than similar maps on the rollers commonly used. *Certificate of Honorable mention.*

107. John H. Harden. Adjustable Drawing Board Trestle. By this trestle large drawing boards are adjusted to any desired height and inclination, and in any direction.

Certificate of Honorable mention.

151. I. Newton Pierce. Folding School Desk and Seat. The seat and back of this desk are so constructed as to conform to the shape of the pupil; the folding and unfolding of the lid and seat are easy and noiseless; the lid may be used in positions either horizontal or inclined; there is a book box beneath the top which is locked automatically by folding the lid; the ink well is locked by the same movements, and the mechanicism by which the various adjustments are made, is simple and ingenious.

Certificate of Honorable mention.

1037. J. A. Bancroft & Co. H. L. Andrews' Gothic School Desks and Seats. This series consists of a folding lid desk and seat, a lifting lid desk and seat, and four sizes of stationary top desks and seats. All these have comfortable seats and backs, constructed in curves on physiological principles to conform to the person of the sitter. They are strong and durable, pleasing to the eye, and constructed without any mechanical contrivances to get out of order. They have foot-rests adjustable to four positions to suit pupils of different sizes. The seats are raised and lowered by means of a patent joint with three stops, so arranged that if one should give way, another will hold. The ink wells have non-corrosive covers, moving in quarter circles, and grooved to form pen racks. These desks may be shipped in pieces, called "knock down," and set up by any workman of ordinary intelligence, thus greatly diminishing the cost of transportation. The smallest of the series occupies but twenty-one inches of floor room, and the largest but thirty inches.

The folding desk has the following peculiarities: The lid consists of a horizontal part which opens upward, and an inclined part which folds downward. By lifting the horizontal part, the books are placed in and taken out of the receptacle from the open top of the desk; without folding the lid, the movable top may be made to support drawings or writings to be copied, or to serve as a book-rest with the lid either open or folded. The ink well is placed so as not to be moved by the opening or shutting of the movable top.

This desk, like other folding desks, would be convenient in school rooms which are used for public meetings. *Silver medal.*

Respectfully submitted,

Wm. H. Allen,
George Eastburn,
Geo. W. Fetter,
Committee.

CLASS No. 38.—Soaps and Perfumery.

954. McKeone, Van Haagen & Co. White Castile, Toilet and Laundry Soaps. Their Laundry and Family soaps, for various purposes, were each submitted to a careful examination, and we would especially commend the White Castile soap, which we believe to be a pure Olive Oil and Soda soap. Their Toilet soaps were also examined, and were found perfectly neutral, affording a good lather, and leaving the skin in a desirable condition. For White Castile Soap,
Silver medal.

1124. Wm. Conway. Laundry Soaps. These possess merit for Laundry purposes, but are alkaline to some extent, and on this account we are of the opinion that they would not be as meritorious as the foregoing, but in other respects we believe them to be excellent, of their kind. *Bronze medal.*

80. Joseph S. & Thomas Elkinton. Soaps. These were the subjects of next consideration, and we desire to speak favorably of their Clarified soap, which is pure, yielding a good lather and possessing excellent detergent properties, but slightly alkaline.

With regard to their Family soap, Laundry, and soap for woolen mills, we are not so well convinced of their superior qualities, as compared with some others, but as far as appearance and consistency goes, we wish to speak well of them. For their Clarified Soap,
Bronze medal.

582. Wm. Wrigley. Mineral Scouring Soap. In this was found a large percentage of inorganic material, and the small amount of saponaceous material contained in it, prevents it from being legitimately classed with soaps. It should more properly be classed among housekeeping articles, and as such is useful and convenient for cleaning paints, metals, marble, knives, etc. *Bronze medal.*

855. Arthur Fricke. Perfumery. Extracts for the Handkerchief. These were submitted to a careful comparative examination, and in the majority of the odors, for delicacy and permanence, they take the first place. *Silver medal.*

49. Samuel Campbell. Cologne Waters, etc. The Extract of Hyacinthine was found to be delicate and fragrant. His Colognes,

upon examination, did not compare favorably with others which were familiar to the committee. For his Extract of Hyacinthine,

Certificate of Honorable mention.

523. H. A. Vogelbach. Extracts. These, of which he exhibited a complete line, though possessing some merits, were found lacking in permanence and delicacy of fragrance in comparison with the others. His Florida Water, although the best exhibited, did not possess sufficient merit, in the opinion of the committee, to entitle it to an award.

30. S. C. Upham. Centennial Bouquet. This impressed the committee with several desirable qualifications. His other perfumes were inferior to some exhibited. For his Centennial Bouquet,

Bronze medal.

367. Wm. M. Wilson & Co. Florida Water. Is nicely put up for trade purposes, but the Committee were not favorably impressed with its merits.

711. W. H. Savournin. Lily White, Toilet Powder and Rouge. These preparations were attractive in appearance, and possessed merit. *Bronze medal.*

Geo. M. Ward.
A. B. Taylor.
G. Krause.
Joseph P. Remington.

Committee.

CLASS No. 39.—Heaters and Ranges.

The committee on Class No. 39, Heaters and Ranges, would respectfully report that they have attended to the duty assigned them, and desire to say that the display in their department was very extensive and creditable to Philadelphia.

We propose to classify our department, and report on those particularly worthy of notice.

We desire to state in particular mention of the goods, that all are worthy of examination, but not all new. We think all desirable for use in their way, but not superior.

1042. Jesse Reynolds & Sons. Wrought Iron, Air-Tight Furnace, for setting in brickwork. Air Tight Pyramidal. A thoroughly well made pyramidal furnace, made air-tight in the drafts by doors ground into the frame, giving entire control of the fire. All the iron work strong and heavy.

They have in use a patent automatic heat and draft regulator, which they claim maintains a uniform temperature within the house in the various changes of temperature, without any other attention to the furnace, than raking out the ashes and supplying fuel.

The plan is: two shallow, air tight drums placed in a tight sheet iron box, open to the air chamber of the furnace, that they may be influenced by the heat of the same; the heat expanding, the drum raises a lever placed upon it near the middle; a chain at each end is attached to two valves, acting on two pipes, one entering the gas flue, the other the ash pit; when the heat expands the drum, that side of the lever is raised and allows air to enter the gas flue; when it sinks as the air chamber is cooled, the draft is opened into the ash pit, and the fuel is supplied with air. A weight on the lever is the cause of regulation of quantity of heat required in the house. *Silver medal.*

1041. Jesse Reynolds & Sons. Centennial Hot Air Furnace. Is well adapted for bituminous coal, the pipes and flue being very large, and arranged so as to be easily cleaned, and with large radiating surface. It is regulated and controlled by doors and slides made air tight by planing and grinding. *Bronze medal.*

1043. Jesse Reynolds & Sons. Air Tight Portable Furnace. A pyramidal fire chamber with permanent radiators. Grate bars separate so as to replace when burned out separately. The flues are readily cleaned out as arranged.

71. D. Mershon & Son. Air Tight Russian Heater. Sheet iron cylindrical fire-box, lined very high. Manyfold drums connected by four pipes, the lower drum constructed so as to clean out without removal. Fire chamber and drums made of red iron. They claim that this quality of iron will not rust so readily as blue or bloom iron. The evaporator high up in the air chamber causing a very moist air. They control the fire by means of a chain to any upper room acting on a valve opening into the gas flue. *Bronze medal.*

509. J. P. Hayes & Bro. Rotary Hot Blast Portable Heater. Lately patented. A series of annular chambers communicating inside the cylinder, by ½ inch holes. These rings are about seven inches apart. The cylinder is formed in this heater by three sets or ring cylinders. The casing is composed of two casings forming a chamber and divided so as to cause the air to travel to the point nearest the cylinder when it enters the chamber (warmed) at the bottom. There is a sliding grate with draw bars, intended to let down a portion of the ashes while the body of coal is sustained by a four-pronged poker used as temporary grate, the process repcated until the ashes are all removed. They use at the escape gas pipe a draught valve to check the air through the fire chamber.

Certificate of Honorable mention.

1097. Fuller, Warren & Co. The Ruby Surface-Burning Furnace. Particularly intended for soft coal.

1099. Fuller, Warren & Co. The Pearl self-feeding Furnace. A combined self-feeding, surface-burning furnace, with a magazine and clinker grate, all of cast iron, well fitted.

Pearl. Portable, in all respects like above, except set on a cast base arranged with movable panels, to attach cold air conductor.

780. Thomas Richard Stevenson & Co. Phœnix Portable Furnace.

364. McCoy & Roberts. Cold Case, Hot Air Portable Heater. A triple case of peculiar arrangement of perforations. The air enters the outer chamber at the bottom, and into the second chamber by two series of perforations, one above the other; thence down, after being partially heated in the two middle chambers, into the inner or third chamber, striking the bottom of the cylinder from the lower middle chamber, and the sheet iron of the inner chamber, above the fire, from the upper middle chamber. The grate is shaken by a perpendicular lever, moved without opening draft door. A sliding door in the dust flue allows clinkers from the cylinder to be dropped directly into the ash pit; a flue from the poker hole into the feed-flue, draws all ashes through the fire chamber, when the feed door is shut at raking and cleaning out the furnace. The furnace has been in constant use during the Exhibition, giving a large amount of hot air through two hot air pipes. *Silver medal.*

136. Morris & Haines. Wrought Iron Heater, in brickwork. A good, strong, well fitted furnace, without any new thing, except the top has a series of conical openings for the hot air flues.

37. John McConn. Steam Radiator. Bunches of Steam Radiators of east iron, having large radiating surface, the steam passing through many spaces in each radiator, making a long circuit in a very compact bunch of radiators. The committee think this an improvement on circulating pipes. *Bronze medal.*

1083. Frank Wistar. Steam Radiator. Carr's Positive Circulating Vertical Tube Radiator. A neat design, well gotten up.

COOKING STOVES.

199. Stuart, Peterson & Co. Rising Sun Cooking Stove. A flat top stove of usual style; large deep ash pit outside front of the stove, allowing the ashes to fall far away from the grate. The arrangement of the grate is the improvement. The bottom of the grate is formed of two wheels, hung on pivots over a plate, each acting on the other by a connecting pin; a bar projecting through the plate on the left side of the stove, is worked by a lever, each wheel moving in opposite directions, thoroughly sifts the ashes. A small portion of the front of the grate is hung on a riveted hinge, and by turning this out, the bottom of the fire is exposed, allowing the cinders and slate to be removed. The bottom of the grate being on a lateral axis is easily dumped. All the cross-pieces are double.
Not entered for competition.

781. T. R. Stevenson & Co. Times Cooking Stove. A large oven stove, for coal; heavy and well fitted.

274. Leibrandt, McDowell & Co. Radiator Parlor Cook. A neat, convenient Dining Room Stove; can be used to cook over the fire, with an effective oven below the fire.
Certificate of Honorable mention.

RANGES.

1044. Jesse Reynolds & Sons. Nickel-plated Kitchener or Cooking Range. A flat top, double oven Cooking Range; heavy, well fitted and substantial.

1098. Fuller, Warren & Co. The Warren Elevated Oven Range. The usual elevated oven arrangements, with warm closet above the castings, are first-class and well fitted

364. McCoy & Roberts. Uncle Sam Cooking Range. Claims: first, the patent side-shaking, anti-clinker grate; second, clinker cleaning apparatus, by which clinkers, slate, etc., are removed without disturbing fire, or, if desired, readily dropped into ash pit, without dust or inconvenience. *Not entered for competition.*

509. J. P. Hayes & Bro. Favorite. An elevated oven of usual plan, claimed to have fifteen per cent. extra weight of castings. *Not entered for competition.*

404. Stout & Marenbeck. Rival. An ordinary side oven warm closet range. The fire pot top is spread out very much and depressed, so as to reflect from a small fire under each of the pots more than usual.

137. Morris & Haines. Range, in brickwork, with Circulating Boiler. A good, well made, heavy range.

HEATING STOVES.

199. Stuart, Peterson & Co. Stoves. Juniata. A highly ornamented heating stove of cast and sheet iron. The plan appears to be: three currents of air from different points circulate through six pipes through the fire chamber, and carried through a drum to an upper chamber, or let out into the room in which the stove is placed; a large magazine holds a supply of coal for twenty-four hours; a water basin near the top. A double cover over the magazine ground to prevent an upward current through the magazine.

The Canopy. A double draft base burner; anti-clinker, conveniently arranged for removing ashes and clinkers. A circular damper near the top controls combustion when the stove is closed up.

Not entered for competition.

783. T. R. Stevenson & Co. Coronet Parlor Stove. A non-clinker parlor stove. The magazine having a reflecting or retarding plate above the magazine to prevent the escape of gas, a double-plated stop to the magazine. Castings fine and well fitted.

1096. Fuller, Warren & Co. The Harvard Franklin Stove. Conveniently arranged with deep ash pit and register in front, also a collar on the top for a flue to carry heat to an upper chamber. Castings well fitted and first-class.

274. Leibrandt, McDowell & Co. Stoves. Dual Parlor. A magazine stove with draw bar grate and collar for flue for heating an upper room.

Zenith. A fire-place heater for the million.

Victor Cook. A well arranged cook stove with a hot closet to set outside of fire-place, and heated by the water back, a very large oven. The water back peculiar, acting as a back, but having an additional length extending into the fire, adding much to the quality of hot water, all the cross pieces double.

Centennial Range. A convenient, strong, good article for the million, cross pieces double.

Sash of Cast Iron. Allowing glass to be put in and secured by putty in four corners. Very suitable for factory purposes.

Registers and Dampers combined. A good idea.

"Truly Yours." A parlor magazine base burner, anti-clinker, three tiers of illuminated mica doors, very easy for cleaning and operation.

Laundry Stove and Cauldron. A cauldron above the sad iron heater, a new combination, convenient to keep water and iron at same time.

Magazine Laundry Room. For forty-two irons, with a magazine for coal. Very durable for hotels or public laundries, or a large institution.

For Victor Cook Stove, *Certificate of Honorable mention.*

GRATES.

1214. Thomas Dixson & Son. Low Down and Elevated Grates. The committee's attention was attracted by the very superior display of grates and fenders, for both design and workmanship. Also the plan of producing a close imitation of flame from wood and coal by gas back logs. Also their system of attachment of flues and dampers for controlling the fire, cleaning the grates. *Silver medal.*

88. W. H. Harrison & Bro. Low Down and Elevated Grates. A display of a very splendid assortment of grates and fenders, elegant in design and workmanship; all of their own designs, except one imported fender. *Bronze medal.*

199. STUART, PETERSON & Co. Sunnyside. Is a widely known and highly approved stove, beautifully ornamented for a fire-place stove. Improved from the original by additional set of mica doors, and convenience of cleaning clinker and ashes.

Not entered for competition.

GAS STOVES.

1224. C. BURNHAM & Co. Reflecting Gas Stove. A very convenient quick-acting stove in a well ventilated apartment.

Bronze medal.

1225. C. BURNHAM & Co. Gas Cooking Stove. A very convenient quick-acting cooking stove for summer use in cooking, washing, and ironing in well ventilated apartments.

Certificate of Honorable mention.

1316. C. GEFRORER. Gas Heating Apparatus in large variety for cooking, boiling and heating tools and instruments, such as sad irons in their variety, soldering irons, curling tube, &c., such as the Bunson Patent can be applied to. *Bronze medal.*

509. J. P. HAYES & BRO. Exhibit several small gas stoves for heating tools, boiling and cooking, without anything apparently new.

913. G. MORGAN ELDRIDGE. Automatic Stove Damper. Claimed the maintenance automatically of a given draft regardless of changes in the outside weather and wind, and the capability of adjustment by the balance rod to any given draft desired to carry.

Certificate of Honorable mention.

293. STROW, WILE & Co. Crucibles. Testimony from Thackara, Buck & Co. Philadelphia; Kupferle & Bonselier, St. Louis; Jackson, Wiley & Co., Troy; Hook Smelting Co. Philadelphia; Samuel Croft, Philadelphia; as being the best crucibles they have used.

Silver medal.

1516. STROW, WILE & Co. Sunnyside Stove Polish. Their stove polish is very superior. *Certificate of Honorable mention.*

1395. A. NEWKUMET. Keystone Stove Polish. Represents to be made of East India plumbago.

Certificate of Honorable mention.

744. Frank Lawrence. Tuyere and Cupola. The improvement, as we are led to understand, being an increased number and elongated form of the tuyere. The air, being forced into a chamber which surrounds the cupola at the points desired, is more evenly distributed through the coal and iron than by the old process of passing atmosphere through two or three tuyeres. From the testimony produced, this is an important improvement. *Bronze medal.*

Your committee above present their report on all the articles subjected to their judgment except Barker's Ventilating Apparatus, Middleton's Regulator and Schopp's Screen Ventilator, all of which they will report on at the earliest possible moment.

Thomas S. Stewart,
Wm. P. Cresson,
Jno. McClure,

Committee.

CLASS No. 39.—Supplementary Report.

798. John Middleton. Automatic Regulator. This is an invention for self-regulating temperatures in dwellings, halls, churches, conservatories, etc. Mr. Middleton, in his communication to the Judges, claims to do and accomplish this, on scientific principles, in a satisfactory manner to all concerned, and he also says this: "we propose to do what is stated with ample power and proper apparatus," a part not described.

It is proposed to be constructed on the principle of an air or differential thermometer, thus: A vessel of any form, and of from one to one and a half gallons capacity, is to be placed in the apartment to be maintained at a required temperature; it is to be hermetically sealed, while the contained air in it is at the required temperature. Two small air-tight vessels, each to be half full of a liquid, are suspended to each end of a cord passed over a friction wheel, the wheel to be supported by a standard, and the small vessels connected to and communicating with each other by a flexible tube; one of them is attached to and communicates with an arrangement like a bladder; the other with the large vessel by a flexible tube, through which they communicate, and also by a rod or lever, extending from it to the

warm-air register of the room, by means of which, actuated by the action of the small vessels, it is to be opened and closed. The operation is explained by Mr. Middleton thus:

"If the air in the apartment becomes heated above the required degree, then the air in large vessel also becomes heated, and by its expansion exerts a pressure on the liquid in the small vessel, with which it communicates, forcing the liquid through the connecting tube into the next small vessel, and the air from it up into the bladder-like attachment; so this vessel becoming heavier than its fellow and counterpoise, sinks down, draws the other up, and in so doing operates the lever and shuts off the warm-air register, and when the air cools the reverse operation takes place." *Certificate of Honorable mention.*

56. Geo. R. Barker. Patent Combined Heating and Ventilating Apparatus. Arrangement for the admission of warm air, and of withdrawing the vitiated air from apartments. Warm air on entering an apartment from a register to a certain extent heats the floor and adjoining parts; this combined with the force and friction of the entering and ascending warm air current causes to be formed a much expanded or rarefied space between the ascending current and the floor, with a tendency of the cooler, and to a certain extent vitiated air, flowing in towards this point, and, as it were, creating an undercurrent over the surface of the floor.

Mr. Barker has taken advantage of the movement of this undercurrent to increase its movement and withdraw it to a certain extent from the apartment; this is accomplished by placing in the brick warm air flue a short metal pipe of a trumpet-formed mouth at its lower end, a quarter bend at the upper; the trumpet-formed mouth extending down in the flue to a few inches below the floor of the apartment and fitting tight around the sides of the flue causes all the warm air to pass up through the pipe. This pipe is smaller than the air flue, leaving a space all around between it and the walls of the air flue or an additional flue for ventilation; a double register, made one-half for inlet and the other for outlet, is placed in the wall, the inlet compartment to the room being uppermost, covering the opening of the bent end of the warm air inlet pipe—the outlet compartment extending to near the floor of the apartment. The operation is thus: The warm air in passing through this pipe keeps it comparatively hot, thereby warming and expanding the surrounding

air in the ventilating portion of the flue; the comparatively dense current previously established along the floor towards this point is drawn on through the register, into and up the flue by reason of the rarefied medium; to assist this ventilating current, if required, an outlet is made on top of the curved pipe, regulated at will from the apartment by a damper, so that an additional current of warm air can be allowed to flow up the flue.

By this arrangement it is evident that a constant circulation of air *must* be maintained within the apartment, so long as warm air is passing through the pipe, which is always the time when the introduction of cold currents from without would be most dangerous or uncomfortable. The apparatus is inexpensive and readily applied, and can be modified and arranged so as to be made applicable in numerous places. We believe it to be a good and efficient arrangement for the purposes intended. *Certificate of Honorable mention.*

67. P. J. Schopp. Patent Pneumatic Screw Ventilator. The Committee think this instrument would prevent the introduction of cinders and smoke, but doubt its efficiency in ventilating to much amount.

Thomas S. Stewart,
Wm. P. Cresson,
Jno. McClure,

Committee.

1325. Shock & Kimball. Stove, Radiant Home. This is a base burning stove with large radiating surface, basket-form fire pot. Ornamented with many large mica windows and of elegant form. The grate is suspended and constructed with stationary centre part and rotating outside section called a "mill grate," for grinding and sifting out clinkers. It is also constructed with a downward draft, by arrangement of a conical opening device, so that when the top is open for any purpose the air is drawn down.

374. George Myers. Bath Range Boilers. In these boilers was introduced malleable iron heads in place of cast iron; otherwise, they were the same as those in general use.

89. W. H. Harrison & Bro. Warm Air Furnaces. This heater is of the pyramidal, or dog-house form, constructed with wrought iron doors, etc. Air tight. There is nothing new in the arrangements, or parts. Believe it will prove satisfactory to persons requiring it. It is well made in all its parts with heavy castings, and has heavy cast iron bed plate with a wide flange turned up to receive the sheet iron case; thereby preventing the expansion and contraction from effecting the joint, or causing a leak of the gas into the warm air chamber. The feed-door and frame inlet is made of cast iron and secured to the cylinder with screw bolts.

Certificate of Honorable mention.

The Portable Heater, by the same firm, is a three jacket heater, or three separate casings, forming two annular spaces, and also a ring of flat circular segments attached to centre casing extending vertically near the whole height, through each of which the air to be warmed is made to pass. The combustion chamber cylinder head is surmounted by a small drum, and is connected by a pipe upon which it may be turned to suit the course required for the smoke pipe, the products of combustion are discharged into this drum through an inlet opening in the side of the connecting pipe, opposite to the smoke outlet. The design and arrangement is a very good one for preventing escape or radiation of heat, retaining the same within the jackets for the legitimate purpose of warming the air. The doors, valves, etc., are air tight, and the poke hole has the double valve, with an opening through the bed plate, through which the ashes and clinkers can be thrown, and by which the dust is drawn in and up with the chimney draft.

452. McCoy & Roberts. Cook Range, set in brickwork. This is a good and serviceable plain range; has a large single oven, flat top with large openings. It was in operation most of the time during the Exhibition. It proved to be an excellent cooking and baking range, and will no doubt give satisfaction to purchasers.

1176. McIlvane & Bros. Foundry Facings. There was no description or certificates given, nor was there any person present to give the committee information of quality or composition of this article, but the committee saw a beautiful sample of stove plates from

Cox, Whiteman & Cox, supposed to be made with these facings, also examined samples of the material.

1308. Barrows, Savery & Co. Cluster Pots for Cooking Stoves. These are remarkable in arrangement for economy of space and fuel —very desirable where small quantities and great variety is required. The tin top covered steamer, intended to prevent the steam from burning the hand is a very good and useful article.

135. Morris & Haines. Portable Heater. This heater has three jackets or separate casings; the inner and outer are as usual, except that on top of the inner one is placed a drum, the head of which is connected to the head of the combustion chamber cylinder, by a short pipe of large diameter having an outlet for the products of combustion, opening into the drum at a side opposite to the smoke-pipe outlet. The drum may be turned upon the joint, as required to suit the course of the smoke-pipe. This inside cylinder is fixed upon an egg-shaped and fluted fire box of cast iron, placed upon a bed plate, part of which is open panels for admission of cold air. The grate has a rocking motion over an enclosed ash box. The poke hole is closed by an air-tight double valve stopper, an opening through the bed plate for an ash duct, placed between the two valves, into the ash box, through which clinkers and ashes may be passed; and the dust be drawn by a draft flue arrangement.

The central cylinder, or jacket of the three, is, in fact, a double one. Thus, a plain vertical sheet metal cylinder incloses another corrugated one of same material, the corrugations being large and of a triangular horizontal sectional form, or like triangular hollow prisms, one sharp angle of each being riveted on the inside of the plain cylinder; thus forming a multifold inclosure of angular faces or sides surrounding the combustion chamber, extending, in vertical height, from bed plate to near the outlets. These triangular tubes being open at bottom and top, up through the inside of which, as also around the various angular faces, the air in being warmed is made to pass. All the doors have ground joints and fitted so as to be air-tight.

These heaters are well and substantially constructed; their arrangement is good, and believed to be useful in retaining the heat within the outer case, and preventing its radiation and waste.

Bronze medal.

243. Charles Williams. Heaters set in brickwork; also, in the Portable form. These are both of a like construction, except that the portable has the usual outer sheet metal case, while the furnace, of course, is set in brickwork.

A cast iron fire cylinder as usual is surrounded by a vertical sheet iron cylinder, of much larger diameter, forming the combustion chamber. This cylinder rests upon the outer edge of a wide circular ring or plate of cast iron, placed horizontally on top of the fire cylinder. This plate is perforated by a circle of large holes with projecting collars, upon which are placed vertical iron pipes, made of heavy sheet iron; these pipes are from six to eight inches diameter, according to size of the furnace, placed nearly close together, surrounding the entire combustion chamber, except at the fire door, thus protecting the case from the effects of over-heating by their conduction of heat, and imparting it to the cold air passing up the pipes. A similarly perforated horizontal plate covers the top of the combustion chamber; the pipes are also continued from the lower collars down to near the bottom of fire cylinder, with a considerable "splay" outwards. Thus a continuous ring, of heavy wrought iron pipes of large diameter, is placed inside of, and surrounding the combustion chamber, and they are continued down, outside of the fire cylinder, to near the cold air inlets at bottom, emptying into the space between cylinder and roof of apparatus or heater. Through these pipes the air to be warmed is forced to pass up, carrying off the heat by contact and conduction. The committee believe this to be a good and efficient arrangement, and the work and material appears to be good. *Bronze medal.*

The Cooking Ranges by the same are good, plain and substantial. Heavy castings, wrought iron oven, with a good and convenient arrangement for cleaning out the oven and ventilating it by an inlet and outlet valve, permitting the passage of a current of fresh air.

Thomas S. Stewart,
Jno. McClure,

Committee.

CLASS No. 40.—Miscellaneous.

Your committee on Class No. 40, (Miscellaneous), respectfully state that they have given to the articles submitted to their judgment, a careful examination, and submit the following report. In a general way, your committee are pleased to notice that said articles, most of which combine the æsthetic with the useful, are of domestic manufacture. To particularize, they notice first in order,

68. N. M. Kerr & Co. Paper Boxes. The boxes made by this firm are generally characterized by a superior workmanship, both in accuracy of fit and excellence of finish. The exhibit in question, besides articles of this class in general demand, includes several novelties deserving of notice: of which we deem worthy of mention, the so-styled Glacé Photo-Boxes, and a variety of jewelers' boxes of paper, furnished interiorly with velvet, etc. The last named articles your committee deem, from their variety and novelty, as a cheap and practical substitute for the morocco and other expensive cases largely used for this purpose. *Bronze medal.*

1453. Thos. Musgrove & Co. Self-Locking Paper Boxes. Designed to carry oysters, confectionery, ice cream, soap, etc., are both novel and practical. *Certificate of Honorable mention.*

694. H. R. Heyl. Patent Wire-Fastened Paper Boxes. These attracted the particular attention of your committee. These articles are all machine made, and represent a decided advance in the useful arts. Your committee are so much impressed with its novelty and utility, that they consider the exhibit in question as one of especial merit, and, therefore, recommend it to the consideration of the Committee on Science and the Arts for the award of the Scott Legacy premium and medal. *Silver medal.*

In the display of caskets and cases for jewelry and the like, your committee find much to praise in the exhibits of Messrs. H. H. Peacock and Geo F. Kolb, both of Philadelphia. Both manufacturers manifest in their exhibits a degree of excellence that is highly creditable.

525. H. H. Peacock. Morocco, Velvet and Fancy Wood Cases. To Mr. Peacock, your committee believe, is due the credit of the highest degree of excellence in the manufacture of inlaid jewel caskets.

The committee cannot pass by without notice the excellence of the metallic ornamentation displayed on several of the caskets executed by him, and the elegance of the honey-comb style of interior fittings, which is claimed to be manufactured by himself only.

Silver medal.

233. GEO. F. KOLB. Morocco, Velvet and Cabinet Cases. In these, your committee find likewise much to praise. His morocco and velvet jewel cases are both novel and tasteful in design, and excellent in finish. This is especially noticeable in a reversible case for displaying jewelry. A combination of music holder and stand, of pasteboard neatly covered with morocco, is worthy of notice; as is also, a novel design of portfolio, for holding and displaying engravings, etc.; substantially and elegantly made for parlor use. For originality of design, and good workmanship in these particulars, *Silver medal.*

154. C. F. RUMPP. Fancy Leather Goods. A highly creditable display of satchels, traveling bags, pocket books. portemonnais, portfolios, dressing and cigar cases, bankers' and lawyers' cases, portable writing desks, companions and the like, in great variety, all of his own manufacture, and manifesting a superior order of workmanship. For so excellent an exhibit of domestic manufactures, *Silver medal.*

558. CHAS. RUMPP. Fancy Leather Goods. An exhibit of a variety of goods, of his own manufacture, including most of the articles above enumerated, besides a useful novelty in the form of a portable dressing case. His display in general is quite creditable.

Bronze medal.

348. EDWARD WATTIS. Patent Pocket Flasks. The novelty in these flasks consists in so attaching the metallic collars that they shall be firmly held to the neck of the flask, without the use of a cement. This is effected by moulding the neck of the flask with a groove about it, and making its extremity octagonal in form; the metallic collars, of corresponding shape, are then mechanically attached to the top of flask, so that they shall firmly clasp the same at the groove. *Bronze medal.*

830. J. HOFFMAN & SON. Pearl Handles, Studs and Buttons. A tasteful display. *Certificate of Honorable mention.*

1415. J. Lachman & Sons. Doll's Bodies.

The goods of the two last named exhibitors, it should be stated, are of their own manufacture.

929. Chas. Este. Native Hard Woods. This display is quite extensive and interesting, as indicative of the growing demand for such materials by our domestic manufacturers of fancy goods.

518. Betanelly & Co. A variety of Insect Flowers, Raw Silk, and several Fancy Articles. One sample of the flowers exhibited, they have imported whole and prepared for use themselves. With this exception, the goods in this exhibit are imported, and several of them quite novel and beautiful.

Mrs. Sarah H. Bancroft. Sick Man's Chair. A very useful and practical form of bathing chair for ladies or invalids. *This chair was highly commended by the judges, and deemed worthy of an award, but was entered too late for competition.*

1029. Jno. Adams, J. L. Bryant and J. A. Pancoast. Life Boat. (Model.) The model in question consisted of two boats, strongly joined together laterally, each of which is provided with air-tight compartments fore and aft, and a central compartment closed with a tightly fitting hatch, for containing provisions and water. From the small size of the model however, and the unreliable nature of any tests conducted with the exhibit in the form and on the scale presented to them for examination, your committee are unable to form an opinion as to its practical value.

Respectfully submitted,

Wm. C. Dixon,
John. W. Nystrom,
William H. Wahl,
Committee.

I approve of the whole of the above, with the exception of the recommendation of the Scott Legacy premium to H. R. Heyl.

Rafael Estrada.

CLOSING CEREMONIES.

ADDRESS OF THE PRESIDENT OF THE INSTITUTE.

On the evening of the 12th of November, the Officers and Managers of the Institute proceeded to the stand which had been erected at the transept. Mr. Tatham, Chairman of the Committee on Exhibitions, made the following announcement:

Mr. President: On the 6th of October, I had the honor to announce on behalf of the Committee on Exhibitions to the vice-president, who then occupied your chair, that the exhibition was ready to be opened. I have now the satisfaction to report on the same behalf that we are ready to close. We have had a season of unexampled prosperity. We have been favored with the finest weather, with entire freedom from accident, with a large attendance, and with the approval of a gratified community. It was originally intended to close the exhibition at the end of last month, but the difficulty of finding competent and willing judges delayed their appointment, and afterwards, the crowds which thronged these aisles were so overwhelming that it was impossible for the judges to perform their functions with satisfaction to themselves. The prolongation of the exhibition was, therefore, in a certain sense, a necessity, and the extended time has not been enough to enable all of the judges to make their reports. It is, therefore, impossible for us to declare the awards to night, but we will do so at the earliest possible moment. The original announcement of this exhibition declared that it would be held in celebration of the fiftieth year of the foundation of the Institute. This fiftieth year shall be to us a jubilee; for by means of this exhibition we shall

be released from a debt contracted nearly fifty years ago, and we shall be enabled more effectually to promote the mechanic arts and thereby, promote the welfare of mankind.

Mr. Sellers, President of the Institute, then made the following

ADDRESS:

Ladies and Gentlemen: It was the custom at former exhibitions of the Franklin Institute to close the exhibition by an address of some kind. The committee to whom was entrusted the arrangement of ceremonies this evening, under the guidance of my good friend, Prof. Robert E. Rogers, has seen fit to tell me that I should say a few words. Had the Board of Managers determined to omit this part of the evening's programme, or had my friend, Mr. Moore, in his speech at the opening, not hinted at it, I question if many of my hearers would remember the usages of so long ago. You must bear in mind that no exhibition has been attempted by the Franklin Institute since 1858, and those of us who took part in that attempt, or have had the care of the finances of the Institute since then, have no very pleasing memory of the many dollars taken from the already slim purse of our treasury to pay for the attempt to show our fellow-citizens what our artisans and our mechanics, were doing. Do you wonder then that for some little time thereafter such exhibitions were not considered with much favor? During the sixteen years that have elapsed since that time, the world has not been standing still. Great events have transpired, and volumes of history have been crowded where as many pages might tell the story of equal years at other times. Our own beloved country has passed through a period of great trial, and seemed at one time likely to be rent asunder; but the old flag waves over all the United States, and I hope when we meet in this city, the birthplace of our nation's freedom, to celebrate the grand Centennial, we can all, North, South, East, and West, unite in thanking God for this unity. The world has not been standing still, nor have our people been idle during all these years; a great work, a humanizing work, has been going on

over our whole land. Even during the period of war were our people cultivating the arts of peace; and each year, each month, and even each day has seen some new industry spring up, either original with us, or transplanted from foreign soil. Now, when the officers of the Pennsylvania Railroad have rendered an exhibition possible, by lending to us this building for this purpose, what surprising advance is shown! how amazing has been the progress! Here, in the space of a little over two acres, under this roof, what a grand collection has been brought together; and all this is the work of our people, in our own land! Philadelphia and its immediate neighborhood has contributed a great part of this; but much of great interest has come from more distant states. Glad would we have been had we seen some representative from each and every State in our whole Union.

Who can enter these doors, walk among the examples of man's skill and not be benefited by the sight? Who can examine that grand display of machinery, the finest ever brought together at one time in this country, without having his mind expanded or avoid a feeling of respect for those whose brains and hands have wrought these great works? Who can contemplate all the objects of beauty here displayed and not experience some mental improvement?

As I sat in the quiet of my own home and pondered over the words I should say to you this evening, my mind wandered continually to this hall, I could see only the world of art and science as it now is, and as here represented, not as it was in the early days of this Institute; and yet before me lay the open pages of the First Annual Report of the Proceedings of the Franklin Institute, of the State of Pennsylvania, for the promotion of the Mechanic Arts. This is dated 1825, and tells of the exhibition held 1824. Few pages were required to enumerate the objects exhibited, and yet these pages are full of interest to us now. Premiums were given then as now, and with the object to foster the industries, special premiums were offered in advance for what was deemed of great importance. At that early

day the Institute did its utmost to encourage the mechanic arts. Its members then as now gave much valuable time in enquiring into the merits of inventions. The managers then declared that "The object of the Institute is by no means to erect itself into an umpire, under the impression of the infallibility, but to communicate to such as may apply for it, the opinions derived from science or experience of its own members; regard being had in the appointment of all special committees, to avoid the nomination of individuals whose prejudices or partiality might affect their decisions in certain cases." This bears directly on the report that is to be made of this exhibition, at the proper time. Judges have been selected with the utmost care to examine and report on all this collection, and those judges have pronounced on the merits of the various exhibits to the best of their ability. This has been a thankless task, as they well know that their report cannot prove entirely satisfactory to all. The reports will be published over their signatures, and it is hoped will prove of use as pointing out the road to higher honors for those who may be lagging in this contest.

Now, that this exhibition has proved so successful, it will be well to mention that its probable effect on the coming Centennial display was carefully considered. It must be borne in mind that the project of an International Exhibition of the arts and manufactures in this city, was originated by the Franklin Institute memorializing Councils on the subject, and it, as a society, has ever strived to aid it, and insure its ultimate success. The question was naturally asked how this exhibition, now so nearly ended, would affect the great exhibition to be then held. Careful consideration convinced us that a successful exhibition held under the auspices of the Franklin Institute would do good, not harm. It would of necessity be mainly a local display,—it would give to our own citizens some little insight into the resources of our city and its neighborhood. It would, without doubt, prove a good lesson to those who intended to take part in the Centennial. And it would induce many to exhibit who were before indifferent. This we now feel has been or will be the result of this

effort on our part. It has, in fact, proved a sort of friendly trial of strength before entering the great contest of '76. The weak see how to make themselves strong; the strong how to gird their loins to meet a greater opposition. And our success has turned the thoughts of many far away to this city. Strangers visiting us cannot fail to take away with them some account of the thriving industries that are here represented and will talk of the greater display in which they will take part, in the hundredth year of our nation's history. In that year the history of the Franklin Institute will have compassed more than half of the nation's lifetime, and intimately woven in its history is the progress of the arts during that time. But when in times past our mechanics and artisans were each year urged to display their industries in our exhibition, great efforts were required to induce them to take any part therein, and none of their exhibitions were truthful exponents of the state of the arts in our midst; save may be in one particular—the handiwork of our ladies. This was well represented in the days gone by, and wonderful were the bed-quilts and the patch-work that competed for our prizes. Where are they in this contest? Has sixteen years numbered them with the lost arts? Dry goods, too, came out strong in those days. Machines in motion were few and far between. Now what a change in all this as shown in this display. There are to-day in this city alone, more spindles running producing textile fabrics, than in any other city in the Union, not excepting those cities in the Eastern States, which are made up of cotton and woolen factories, and the homes of the working people only. Yet these industries have been but sparely represented here. Extended as this display has been in some directions, it does not do full justice to what is being accomplished by all the working people of the State. Many, very many are holding back their strength for that greater show, and noting what has been done here.

I would gladly trace the progress in the arts during the past fifty years, up to the present condition as here shown, could it be done in the limited time I dare address you; but I would be derelict in my

duty, were I to fail to do so in one particular instance—because it seems to me, great principles are involved. The machine display in this room, is unquestionably very fine, and when one glances over that broad expanse of iron servants of man's will, and peers through the forest of belts that give motion to these machines, one cannot but be struck by the remarkable uniformity in color there shown, and doubtless may think the dark gray tint, the absence of all gay colors, indicative of our Quaker tastes and habits. Ladies and Gentlemen, there is, to the student of a nation's art progress, more in that quiet color than can be traced to any such reason. The lesson it teaches is worth learning. Pardon me, if I repeat to you, the oft-told tale, of how man, in the helpless infancy of the race, with his naked hands alone, given him for defense or offense, fought his way in the great struggle for life, with clubs and stones as his only weapons. Clubs and stones were his only implements in tilling the land and ministering to his wants; but at all times did he try to beautify his tools or weapons, and a savage taste guided him in his selection of modes of ornamentation. Century upon century, as the people grew, so did their hands, aided by their growing minds, give them better, more efficient implements; and century by century, these aids to man have grown into what we now see before us. These dumb servitors of mankind, with their frames of iron and their sinews of steel, which for life and motion devour the hard rocks of our anthracite, and in living and moving, breathe from their metallic lungs the hot vapors of steam, are doing our work better, ministering to our wants more freely than could thousands upon thousands of slaves. From the stone implements of the savage to what we now consider the highest type of mechanical skill, the desire to ornament, to beautify, has always guided the makers or their users. When machine-making became a trade, still man, seeking to satisfy his innate longing for the beautiful, borrowed from other arts, regardless of fitness, forms and colors of acknowledged beauty. He called to his aid every type of architecture, and decked his Gothic or Corinthian steam engine with all the gorgeous hues a

painter's pallette could offer him. As man's taste develops by culture, he learns that beauty cannot be separated from fitness; that the most graceful forms, the most lovely colors fail to satisfy the eye when transported from their proper sphere or inharmoniously blended. It is an uneducated taste that finds satisfaction in brilliant colors only, or seeks to beautify uncouth forms by gorgeous paints, while a higher culture fashions forms to suit the purpose for which they are designed, and colors them in subordination to their uses and surroundings. The grotesque architectural machinery of not many years ago is now seldom seen; conventional forms, beautiful enough for some purposes when wrought in wood or stone, have been abandoned, so that, now looking over this typical collection of machines for so many varied uses, we find that a new order of shapes, founded on the uses to which they are to be applied and the nature of the material of which they are made, have been adopted, and the flaunting colors, the gaudy stripes, and glittering gilding has been replaced by this one tint, the color of the iron upon which it is painted.

That sombre tint is no indication of any Quakerish objection to bright colors, but indicative of a higher culture and more refined taste. Two years hence, those who hear me now will perhaps think of this question of taste when they look at what other nations will send to our shores, and display, side by side with our work, yonder in our park. Americans, some years ago, had earned for themselves the reputation of a savage liking for gay colors in ornamentation, not common in other and older countries. That a great change has taken place in the right direction in machinery this wonderful exhibition testifies; how far it has progressed in other trades I do not feel competent to judge, but I do feel very sure that the year 1876 will bring to us, in the greater exhibition—a nation will then hold—many a useful lesson in beauty of form, in humble objects; in the art of surrounding ourselves and homes with forms of beauty that satisfy æsthetic tastes, and give color and grace to our living. Most sincerely do I hope that my countrymen may feel that their display, in comparison with that of older nations, satisfies themselves, for I do know

the American people are quick to appreciate, to learn, and to profit by their learning.

Now, a few words about what has been done by those who have labored so zealously to give us this exhibition. On the 19th of last August, the building in which we stand was a freight depot, abandoned for a more commodious building. The dust of many years rested on the beams above our heads, and the floor was like that of any stable. Almost hopeless seemed the task of cleansing; but the Franklin Institute lacks not willing hands and able minds. Chemists and mechanics gave their best talent to the work. A chairman of the exhibition committee, of rare fitness for his task, made admirable selection of superintendent and aids, and the work went bravely on. The room was ready ten days before the time fixed upon for the opening; but, at what a cost of labor and patience, those interested alone know. Their labors, their willingness, and their generosity, make a bright page in our society's history.

That the exhibition has proved a grand success is owing also to those of you who have placed your handiwork and your productions here; who have entrusted so much of rare interest and great value to our keeping. Little time was given us to draw you together, and but little for you to prepare; and we are sorry that we could not find room for all who at last desired space.

Ladies, you too have aided us, your presence has lent additional charms to the exhibition's many attractions; your handiwork is represented in many beautiful exhibits—albeit, the bed quilts of an older generation are missing from our walls; new channels are being opened to your industry every day, and many of the active trades of this city, as here represented, prosper under your directions. It may be significant, this year has even seen some of your names added to the roll of members of this Institute. Those of you who have been requested to act in the undesirable capacity of judges, have done good and satisfactory work.

Gentlemen of the press, we have to thank you for much valuable aid. When the project of this exhibition was first broached, many

of you wrote strongly advocating our cause; and appreciating the difficulties of our undertaking, lent efficient encouragement. Those of you who spoke only kind words when our task was the hardest, are remembered as our staunch friends. When the story of this exhibition is published, there will be read a list of names of citizens who having faith in the Franklin Institute, and appreciating the efforts it is always making to foster the mechanic arts, subscribed their names to a paper pledging themselves the amount set opposite thereto, to hold the Institute free from loss, in case the exhibition should not prove pecuniarily successful, many of these are of citizens not members of the Institute; it is now reasonably certain that they will not be called upon to pay any loss; in fact, it is hoped that some much needed money will be added to our treasury, and the Institute will be better able to go on with its work. When these gentlemen signed their names, they had nothing to assure them that they would not be called upon for the money; other exhibitions of the Franklin Institute had not paid expenses. Why should this? It has doubtless paid, however, and we will rejoice when these kind friends are formally and publicly relieved from their obligations, and most sincerely do we thank them for their help.

Fellow-citizens, the hour draws near when the curtain will fall and hide from sight this bright scene. The names of many hundreds of you have this year been added to our roll of members. You have lent your aid thus far, you will surely continue to take part in the work of the Institute. Let not your interest end when these doors are closed; be present at our meetings; give us the advantage of your varied experience; aid our journal, the only publication devoted to the promotion of the mechanic arts, not controled by local interest or biased by personal prejudice: aid it with your pens and purses.

Whether in the coming years we re-open our doors for such a display as this, is yet undecided. If we do not, it will be for good and important reasons. The year of the great Centennial is close upon us; little by little over the land has grown the interest in it. Slowly, but surely, are all our people awakening to the appreci-

ation of the fitness of the eelebration of a nation's birthday by a display of a nation's greatness, of a nation's growth in contest with the whole world, on the ground where one hundred years ago stood the capitol of the Infant Republic, in the eity where our liberty had birth. The objects that will elaim spaee in that great exhibition are now being made, not here only, but over the whole eivilized world. What ean be donc by the Franklin Institute as a society, or by its members as individuals thereto, should tend toward increasing the suecess of that great undertaking. There, in yonder Park, among the green trees and by our beautiful river, away from the noises and bustle of the streets of a great eity, aeres upon aeres of buildings will be crowded with the industries, the arts of the whole world. At the thought of sueh a display, what is here seen in this room seems small indeed. What is prominent here will appear less so in those vast halls; but bear in mind the perfection of the whole depends upon the perfeetion of its individual parts. Each one of you who contributes examples of his industry, arts or accomplishments to that great exhibition must do so with the confident belief that the burden of sustaining the credit of our country in that eontest rests with him alone.

As president of a soeiety that has for half a century labored zealously to promote the mechanic arts, I dare not lose this opportunity of saying a few words in the interest of Ameriean manufacturers. All obscrvant visitors to this hall must have notieed goods displayed as of home make, which they had believed were always imported. Let me tell you, for I know it, there are prosperous industries in this eity making goods of exeellent quality, which you, ladies and gentlemen, purchase as of foreign makc. The makers of these goods say they would find no purchasers, should they mark them as Philadelphia made. Gentlemen, you seleet at your tailors cloths that you are assured are the best imported goods. This may bc so—in faet, really is in many cases—but the produetion in this country of looms to weave the finer eloths is a growing trade, and these looms send fine clothes into the market, which under fancy names are sold. Ladies,

I have held in my hand the wool—seen it carded on the finest machines, or combed for worsted yarns on the same machines as are used abroad, spun into yarn and woven on American looms into the finest fabrices, you are now wearing—no, I would rather say that some other ladies are wearing, confident in the belief that they are decked in garments made in France, in England, in India— anywhere but in their own land. I will not say who is to blame for this, whether the manufacturer who hides his own name, the tradesman who buys the goods and sells them as imported, or we ourselves, who think home-made articles not good enough for us. I would not have you purchase poor workmanship, because it is home-made, in preference to good work from abroad; that will not compel progress in the arts; but I would have you show a preference for what is well done in your own land.

Franklin, in the memory of whose usefulness this Institute was named, discouraged the purchase of foreign finery, when our nation was so poor one hundred years ago. What he saw as a necessity in the light of self-protection then, may be less so now, for a wholesome tariff has shielded our workman until home competition in well-organized business has enabled us to export what we used to import. The Franklin Institute, which was founded to promote the mechanic arts, asks your aid, your encouragement, and preference for all the good work our mechanics can do.

TREASURER'S REPORT

OF THE RECEIPTS AND EXPENSES OF THE TWENTY-SEVENTH EXHIBITION HELD BY THE FRANKLIN INSTITUTE, 1874.

Receipts.

Ticket account.	Received from sales, -	$85,556.10
Pulley "	" sundry persons,	504.77
Entry "	" "	4,995.00
Building "	Reeeived from sundry persons, sale old materials, etc.,	426.40
Coal & Gas acc't.	" " for use of same,	550.89
Gas Fitting "	" " "	2.50
Steam " "	" " "	73.90
		$92,109.56

Expenses.

Gas Fitting account.	Paid sundry bills. -	$2,818.85
Entry account.	" " - -	45.00
Pulley "	" " -	588.51
Premium "	" " - -	1,612.24
Coal and Gas account.	" " - -	4,671.75
Steam Fitting "	" " - -	1,780.89
Water Fitting "	" " - -	930.71
Advertising "	" " - -	3,650.81
Building "	" " - -	10,246.95
Printing and Stationery acc't.	" " - -	1,680.84
Labor account,	" " - -	1,291.44
Incidental account,	" " - -	750.00
Ticket "	" " - -	1,882.27
Watchmen and Police account.	" " - -	3,225.80
Salary account.	" " - -	2,764.11
Boiler Test account.	" " - -	1,744.69
Interest account.	Paid Discount on Loan. - -	53.33
	Balance, -	52,371 37
		$92,109.56

FREDERICK FRALEY,

June 21, 1875. *Treasurer.*

N.B.—The expense of publishing this Report is not included in the above account.

APPENDIX.

SUPPLEMENTAL REPORT OF JUDGES.—Class No. 29-1.

FRANKLIN INSTITUTE EXHIBITION, 1874.

APPENDIX.

Supplemental Report of Judges.[*]

CLASS No. 29–1.

TRIALS OF STEAM BOILERS,

At the Franklin Institute Exhibition, November, 1874, *at Thirteenth and Market Streets.*

To the Board of Managers of the Franklin Institute of the State of Pennsylvania:

GENTLEMEN.—The undersigned, the Judges appointed by you, beg leave to report as follows:

Four Boilers were entered for competition. In the order of trial they were: The Exeter, The Norris Iron Co.'s Improved Rogers & Black Boiler, The Wiegand, and The Harrison.

Trials were made to determine their evaporative efficiency, as well as to ascertain the dynamic value of the steam which they produced when worked through one and the same engine. These trials were made under the published rules, a copy of which is hereunto annexed:

TO EXHIBITORS.

The "Rules and Regulations" of the trials were furnished to each exhibitor, who was requested to see that his boiler, with all its appliances, was ready for trial, and was also required to furnish the Judges a drawing and full description of the same.

As the "Rules and Regulations" were written for the benefit of the exhibitors, and respectfully referred to them for their consideration,

[*] See page 117, "Reports of Judges."

it is believed they understood the methods to be pursued by the Committee, and if any exceptions were taken they should have been made in writing previous to the commencement of the trials.

MODE OF CONDUCTING THE TRIALS.

Before commencing the trials it was ascertained that the boilers and all their steam and water connections were perfectly tight, and that every part of the steam pipe was thoroughly felted. All surplus steam and water connections were cut off from the boiler, and the steam pump feeding the same was, during the trial, supplied with steam from one of the other boilers.

By these precautions it was certain that all the steam passing through the engine was measured as water in the tanks before entering the boiler. The quantity of water supplied to the boiler was carefully measured, the coal and wood burned were weighed and indicator diagrams from each end of the cylinder of the experimental engine were accurately and regularly taken.

At the commencement of each trial the fires were drawn, the coal and ashes removed from the pit, as well as all the coal from the floor in front of the boiler.

A scale was provided and tested for weighing the coal, wood, and ashes.

Previous to drawing the fires, the boiler had been kept under steam for twelve consecutive hours, and the water forced in the boiler to the height at which it was to be maintained throughout the trial.

Starting with a clean grate and the use of sufficient wood and coal to raise the pressure of steam to 80 pounds per square inch, the trial was considered as having commenced.

A record was kept of the trial, both at the boiler and in the engine room; the revolutions of the engine were counted by an engine register.

Indicators were attached, one to each end of the cylinder, and diagrams were taken simultaneously every half-hour, except in the trial of the Exeter, when the records were every twenty minutes.

One minute prior to the taking of an observation, the gong in the engine room was sounded twice, to call attention of the assistants in charge, and when the clock indicated the half-hour, it was again sounded; at the instant, all the records were made simultaneously, both at the boiler and engine.

Two lines of four inch (internal diameter) steam pipe were arranged with stop valves so that the steam from each boiler under trial could be conveyed through one of them to the engine used during the experiment, while steam was being conveyed through the other from all the other boilers for Exhibition purposes.

Several times during each trial, examinations were made of both pipes, to be certain that all the steam from the boiler under test passed to the experimental engine and none was added to it or lost in the passage thereto.

The amount of water evaporated was determined by first weighing it in two open tanks, each of about 700 pounds capacity, each tank being placed upon a tested scale.

Each tank was connected alternately with the steam-pump, by a rubber suction hose, provided with a strainer and check-valve, in order that it could be quickly changed from one tank to the other without loss of water.

The tanks were filled through a hose connected to the street main, and when full the hose was thrown out of the tank.

The tank and pipe connections were all above ground where they could be inspected at all times.

The pipe leading from the feed-pump to the boiler had no branch connections and the blow-off pipe was entirely disconnected.

The measurement of feed-water was constantly attended to by an assistant, and every separate charge of water to the boilers was entered in a book kept for the purpose.

The temperature of the water in the tanks was taken each time they were filled, by moving a thermometer through it and was also entered as above.

The steam pressure in the boiler was shown by a steam gage connected thereto, and by a mercury column attached to the steam-pipe, also by two other mercury gages, one at each end of the steam-pipe.

The temperature of the escaping gases from under the boiler was ascertained by a pyrometer inserted in the flue about 12 inches from the boiler.

The temperature of the air was also observed in several places, both in the boiler and engine-rooms.

The thermometers used are known in the trade as "Chemical Thermometers," the whole instrument, including its porcelain scale,

being enclosed in a glass tube; after the trial each was carefully tested.

The indicators used were Richards', and were excellent instruments. Diagrams were taken simultaneously from each end of the cylinder, specimens of which are given.

During the trial the pressure and temperature of the steam, also the temperature of the feed-water and products of combustion as they entered the chimney were taken every half hour.

The water level was fixed at a height determined by the exhibitor, and a mark was made on the water gage-glass at that point.

This point is noted 0 in the record; when the water rose above it the height is noted + and when it fell below it was noted —

In the first two trials the water was furnished by the Knowles' Patent Steam Pump, kindly loaned by Messrs. Potter & Hoffman, agents, in this city; and in the last three experiments by one of Conde's Patent Steam Pumps, placed at the disposal of the Judges by Messrs. C. A. Conde & Co., manufacturers, in this city.

The Pyrometers were furnished by Edward Brown, and the Scales and Tanks by S. Lloyd Wiegand.

PRONY FRICTION BRAKE.

The brake consists of a pulley, 38 inches in diameter, 18 inches face, secured concentrically to the shaft of the engine. This pulley is embraced by a cast-iron casing, lined with wood, which makes the frictional surface. For convenience of handling this casing, it is made in halves.

To this clamp is attached a lever, to the end of which is secured the scale pan. The distance from centre of engine shaft and the latter being the radius of a circle 66 feet in circumference.

A short distance from the scale pan, a hydraulic regulator is attached to the lever. This consists of a cylinder open at top, and fitted with a perforated piston, which is connected to the lever of the brake.

Any sudden tendency of the lever to move is checked by the resistance the piston meets in the water, while any gradual change in the lever will not be retarded.

Before attaching the pulley to the engine shaft to be tested, it was mounted on a mandrill, which was placed on smooth iron sur-

faces, the same as in working condition, and the weight at point of suspension was then accurately taken. This weight added to the weight put in the scale pan would measure the resistance of the friction at the time it was taken. This measure of power is reduced to foot-pounds by multiplying the weight by the number of revolutions per minute, and by 66, the number of feet that would be described by the point of suspension of the scale pan at each revolution. This divided by 33,000, gives the number of horse-power.

ORDER OF TRIAL.

EXETER.

The "Exeter" Boiler was placed first in order for trial and on Saturday, November 7th, 1874, after considerable delay in arranging the necessary apparatus therefor, the trial commenced at 5.30 P. M., ending at 3 A. M., Sunday.

The consumption of fuel and feed-water was very regular, but the steam pressure varied very much throughout the trial.

NORRIS IRON CO.

At noon on Monday, November 9th, the trial of the Norris Iron Co.'s Improved Rogers & Black Boiler was commenced. The exhibitor entered this boiler, for competition, as a 35 horse-power boiler, but when the trial commenced, it was found that the steam generated could not be worked off without running the engine at too high a speed; the water-gage broke and the trial was therefore discontinued; the resistance to the engine was increased to 50 horse-power, the water-gage repaired, and the trial was recommenced at 7 P. M., ending at 5.20 A. M., Tuesday, the 10th.

This was the only boiler on trial that was arranged specially to superheat its steam; the escaping products of combustion ranging between 630 and 710 degrees.

The water was supplied very irregularly, the firing rather indifferent, therefore the steam fluctuated very much throughout the trial. Much water was blown off through the gage-cocks and towards morning two of them leaked badly for several hours.

HARRISON.

This trial was started at 2 P. M., but the supply of steam for running the pump was allowed to run down by 3.30, slowing the pump below speed, so that the water level could not be maintained, which was a disadvantage to the boiler. At 7.30 and 8.30 P. M. the pump was stopped five minutes for the want of steam, and again at 10.30 ten minutes; the water falling so low that it was considered inexpedient to proceed, the fire was withdrawn five minutes later, so as not to burn the boiler, thus reducing the whole time of experiment to $8\frac{1}{2}$ hours. The steam pressure and consumption of fuel were very irregular from the above causes.

WIEGAND BOILER.

On the following day no trial was made, from the fact that this boiler being 80-horse power, the proper resistance for the engine was not ready, but on Thursday, November 12th, at $9\frac{1}{2}$ o'clock A. M., the trial was commenced.

The firing during this experiment was the best in all the trials, the steam pressure varying but little from an average of 75 pounds per square inch, the consumption of coal uniform and the water level evenly maintained. The damper was used to regulate the fires; the trial was continued without interruption through the proposed ten hours, ending at 7.35 P. M.

HARRISON BOILER.

The second trial of this boiler was ordered for Friday, the 13th inst. Prior to its commencement, the steam was raised to 110 pounds per square inch, to test the joints for tightness, on account of its having been used with low water on the former trial. Without authority, or knowledge of the Judges, some one opened the stop valve of the steam pipe blowing out all the mercury from the gages and mercury column connected therewith, causing a delay of several hours to refill them. The column could not be got ready in time and the trial was commenced without it, which the Judges regret. The trial commenced at 1.45 P. M., under very unfavorable circumstances, as the temperature of the atmosphere had fallen some 27 degrees, the Exhibition being ended, the doors

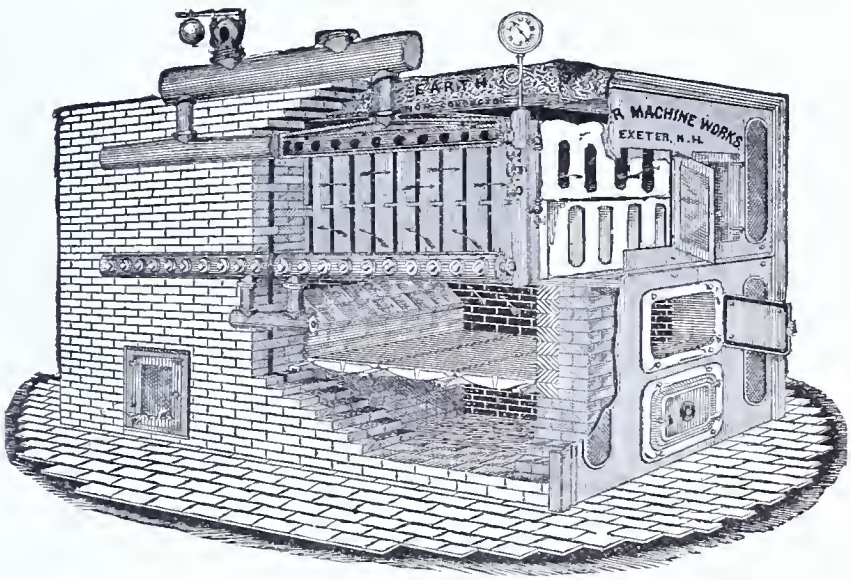
were all open for the removal of goods, which interfered materially with the progress of the trial. At 2.45 P. M. the engine was stopped some five minutes on account of a hot journal on the line shafting. The trial ended at 11.45 P. M.

The firing during this trial was excellent and the steam pressure good, but not equal to that in the Wiegand trial.

The representatives of the four competing boilers were present by invitation to witness the trials, to see for themselves that everything was fairly conducted.

DESCRIPTION OF THE BOILERS ON TRIAL.

Exeter.—27 horse-power



This boiler consists of a series of hollow cast iron sections, each of which forms a complete boiler in itself, rectangular in form, 40 inches long, 36 inches high, and 4 inches through—the iron being11-32 inch thick. Each section is cast with twelve passages through it, 2 inches by 12 inches, whose walls give increased strength as well as increased heating surface. There are twenty-nine square feet of heating surface to each section. The brick walls differ from those of ordinary tubular boiler settings only by having cast-iron plates built into the side walls to support the sections. The fire-brick lining in the fire

chamber can be replaced without disturbing the supports. A cast-iron T is built into the bridge wall to unite the supports, allow for their expansion and prevent spreading of the walls.

The sections rest on the supports at sufficient distance apart for the heat to pass freely between them and to allow for their expansion and contraction independently of each other. A space of two inches exists between the brick walls and the sections up to half the height of the latter, where it closed with a projecting heading course.

Square bars of iron are placed between the sections on these heading courses, thereby compelling the draft to traverse between and along the sides of the lower half of the sections to the rear of the boiler, thence up and returning between the openings of the upper half of the sections to the chimney in front.

A steam-pipe, common to all, connects all the sections together at the top. A similar pipe makes a water-connection between the sections at the bottom.

The amount of heating surface is as follows:—

Total area of water heating surface in square feet,	414.	
Total area of steam heating surface in square feet, .	170.	
Total heating surface in square feet, . . .	——	584.
Area of water line in square feet, ...		11.
Fire grate surface in square feet, ...		12.
Ratio of grate to water heating surface, . .		1 to 34·5

Norris Iron Company's Improved Rogers & Black Boiler.

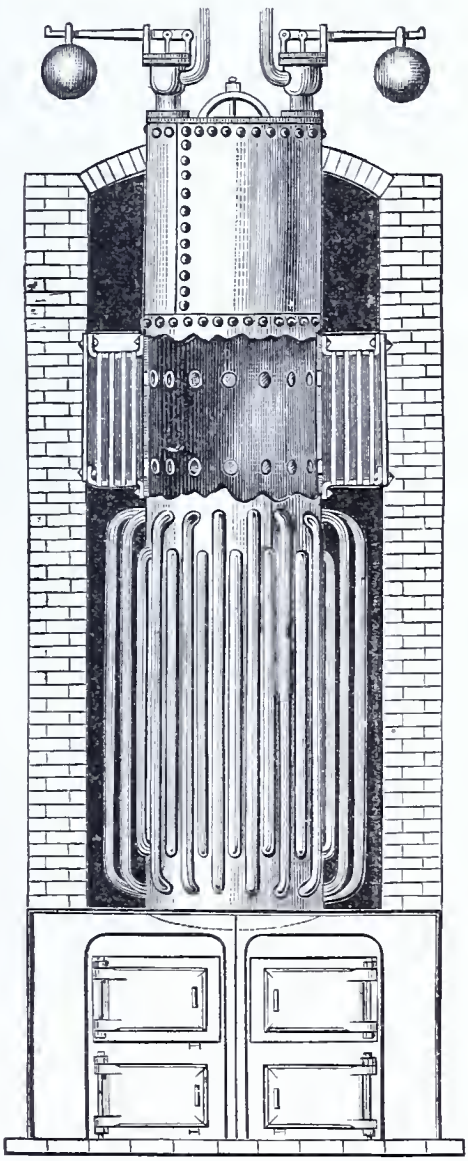
50 horse-power.

This boiler consists of a shell, thirty-eight inches in diameter, and fourteen feet high, suspended vertically by four wrought iron brackets placed equi-distant near the top of the shell, which rests upon the brick casing of the boiler. The shell is invested with two lengths of external circulating tubes of two inches diameter. The average length of these two rows of tubes is respectively 6 and 8 feet; there are 50 tubes in the outside and 25 in the inside row, making a total of 75, which constitute the Rogers & Black boiler.

The improvement consists in placing a Drum, 70 inches in diameter and 24 inches high, around the upper part of the shell above the external tubes, whose annular heads are pierced for 222 tubes 2 inches in diameter and 24 inches long.

The water was carried ordinarily, at about six inches below the top of the flue drum, so that the drum and about two feet of the upper end of the boiler shell were steam space.

The products of combustion pass up the outside of the shell around the outside tubes, thence up through the tubes in the drum to the upper part of the outside shell to the stack which is immediately to one side of it.

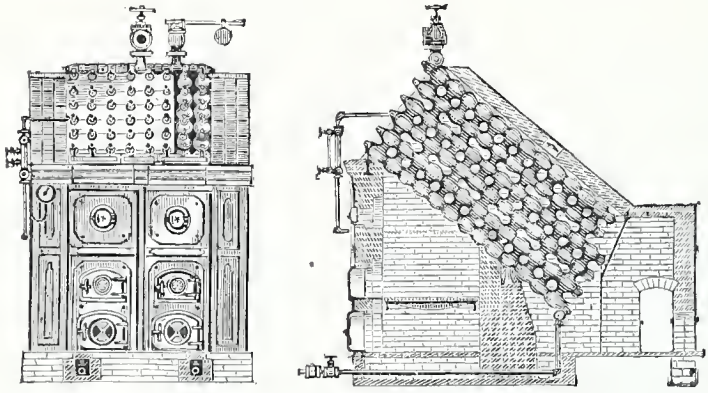


The grate is four feet ten inches wide, four feet nine inches long and placed seventeen inches below the bottom of the boiler.

The amount of heating surface is as follows:—

Area of water heating surface in outside tubes in sq. feet,	288.
Area of water heating surface in inside tubes in square feet,	163.
Area of water heating surface other than tubes in sq. ft.	109.
Total area of water heating surface in square feet,	560.
Area of steam heating surface in square feet in inside tubes,	54.
Area of steam heating surface other than tubes in sq. ft.	47.
Total area of steam heating surface in square feet,	102.
Total area of steam and water heating surface in square feet,	663.
Area of water line in square feet,	22.
Ratio of grate surface to heating surface,	1 to 29.
Fire grate area in sq. feet,	23.

HARRISON TEN SLAB BOILER.—60 HORSE-POWER.



This boiler is constructed of hollow cast iron spheres, each eight inches in diameter externally, and three-eighths of an inch thick, connected by curved necks three and one-quarter inches diameter. These spheres are held together by wrought iron bolts and caps and in one direction are cast in sets of two or four, with opposite lateral openings to each sphere, and are called by the inventor two or four ball units, as the case may be. These units connect by rebate-joints, accurately made on the edge and fitting closely, making when drawn together, a steam and water-tight joint.

The boiler on trial consisted of ten slabs; composed of 82 spheres; each slab six spheres wide; the upper rows being twelve, and the four lower rows thirteen spheres long, the top of the two upper ones have two rows of three each for additional steam space.

These slabs are placed on edge, side by side, one inch apart, with their bottom line at an angle of about forty degrees, the upper corner on said line being supported on a cast iron rail or bearer, while the lower comes to rest on a chair adapted to the purpose, which is placed behind the bridge wall. A common steam-pipe, taking steam from the upper caps connects the slabs together. A similar pipe placed at the bottom corner of the slabs, makes a water connection between them. The steam and water pipes are made up of short pieces connected by spherical joints held together with bolts, after the manner of the units. By this means a flexible connection is made which prevents all trouble in joining the sections together.

The products of combustion rise from the grate, and pass between the slabs, amongst the spheres, and over the bridge-wall, to

the lowest and coldest part of the boiler. A cast iron T bar is inserted nearly horizontally, between each slab a short distance below the water line. This bar prevents direct heat from reaching the steam heating surface, but sufficient heat reaches the upper portion of the boiler to dry and super-heat the steam.

The amount of heating surface is as follows:—

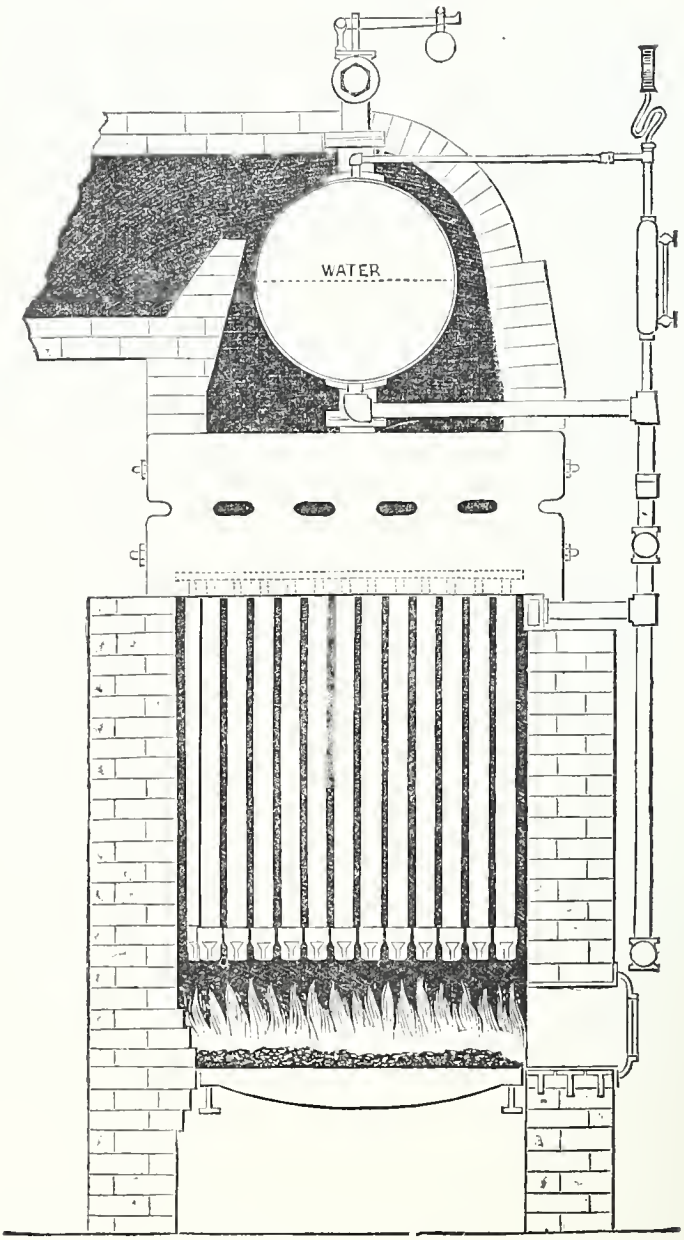
Area of water heating surface in square feet,	783.	
Area of steam heating surface in square feet,	343.	
Total area of heating surface in square feet,	——	1126
Area of water line in square feet,		17
Fire grate surface in square feet,		30
Ratio of grate to heating surface,		1 to 26

Wiegand Sectional Boiler.—80 Horse-Power.

This boiler is composed of a series of separable sections of uniform size and power, placed side by side, and united to one feed-pipe and one steam drum. Each section is composed of a double tank, five feet four inches in length, ten and one-half inches wide, and twenty-four inches in height,—twenty-four lap-welded wrought iron tubes, of three inches external diameter,—with cast iron cups or caps to close their lower ends; a corresponding number of wrought iron inner tubes of one and three-quarters inch internal diameter, one return bend for connecting the tank to the feed-pipe and the necessary bolts and nuts for making the connections to the tank.

The bottom of the tank has two rows of apertures, twelve in each row, into which the three inch tubes are screwed. The tank is divided into two distinct compartments by a perforated diaphragm, placed a short distance above and parallel with the bottom. The diaphragm has two rows of apertures concentric with the apertures in the bottom of the tank, for the insertion of the one and three-quarters inch inner tubes. The cap or cup which closes the lower end of the three inch tube is five inches in length and is cast cylindrical at the part that screws upon the tube, below which it is shaped like a cone or funnel, with three channels extending from the base through its sides to the bottom of the cap, which is shaped like the trefoil. Externally the cap presents three equi-distant wings that afford a convenient means of applying a correspondingly shaped wrench to screw it on or off. Within each three inch tube is placed

a one and three-quarter inch tube that extends up through the apertures in the perforated diaphragm, in which it fits loosely. This arrangement permits an uninterrupted flow of water from the tank through the inner tubes into the caps; from thence upward through the annular spaces between the inner and outer tubes into the tank and through the perforated diaphragm upward.



These tanks are surmounted by a plain wrought iron cylinder, 36 in. in diameter, and of such a length as to extend through the side walls, enclosing the tanks, each tank being coupled thereto. This cylinder forms a part of the water space, and all of the steam space. The products of combustion encircle this cylinder.

Water is supplied to, and blown off from, the section through the same orifice in the front end of the tank, and the steam passes from the top of the tank into the steam cylinder.

The furnace is a rectangular chamber, eight feet wide and four feet deep, with vertical walls, having the usual ash pit, grate bars and fire doors. The heat rises vertically between and around the tubes; also around the tanks and around the steam drum and is equally distributed.

The Boiler on trial consisted of eight of these sections placed side by side, with the tanks one inch apart and the tubes hanging in the furnace.

The amount of heating surface is as follows :—

Area of water heating surface in square feet, . .	996.	
Area of steam heating surface in square feet, . .	44.	
Total area of heating surface in square feet, . .	——	1040.
Area of water line, in square feet, ...		19.
Fire-grate surface, in square feet, ...		30.8
Ratio of grate to heating surface, ...		1 to 32

Steam Engine.

The vertical three post slide-valve steam engine, having a 14 inch diameter of cylinder and 18 inches stroke of piston, entered for competition by Mr. Andrew Watson was selected by the Judges for use, to measure the dynamic value of the steam generated by the several boilers. This engine was strongly built with unusually large bearings, was well secured to a good brick foundation and used for driving the wood-working machinery of the exhibition.

With all the machinery in motion in this department, the indicator diagrams showed but 60 horse-power and as this was found variable during preliminary trials, it was insufficient for resisting the engine when working off the steam from the largest boiler.

The boilers were entered as 27, 50, 60 and 80 horse-power respectively; for this reason the judges ordered the erection of rotary pressure blowers to increase the resistance. After the erection of the blowers it was found that 80 horse-power could be maintained steadily, with the outlet of one of the largest blowers arranged, so that it could be opened or closed to regulate the load in case any of the machinery was thrown off or on during the trial.

Temperature of Boiler Room.

In the first four experiments the temperature of the air in the boiler room varied between 70 and 80 degrees Fahr., but in the last experiment with the Harrison boiler the air was only 53 degrees, for which allowance must be made in the performance of the last experiment.

The absolute zero of temperature is 461 degrees below Fahrenheit zero, and calling t = temperature Fahr. of the air and assuming the performance at 80 degrees as unity, the correction C, for temperatures below 80 degrees will be:

$$C = 1 + \frac{80^\circ - t}{461 + 80} = 1 + \frac{80 - t}{541}$$

For instance, when the temperature was only $t = 53$ degrees, we have the correction:

$$C = 1 + \frac{80 - 53}{541} = 1{\cdot}05$$

Water Carried Over Mechanically.

In order to collect all the water carried over, a steam trap was connected to the steam pipe close to the engine and the water so trapped was weighed every half hour and recorded.

In calculating the results from the records, the Judges first assumed that this amount of water was carried over mechanically, and from the gross amount of water noted, deductions were made as follows:

In the trial of the "Exeter Boiler" the amount of water carried over through the steam trap was 381 pounds, under a pressure of 69 pounds to the square inch above that of the atmosphere.

The temperature of the steam corresponding to that pressure is 315°·25 Fahr.

The temperature of the feed-water was 60° Fahr. and 315·25° — 60° = 255°·25.

The heat lost by the water carried over is 381 × 255·25 = 97250 units.

The heat required to evaporate one pound of water at 60° to steam of 315°·25 or 69 pounds pressure to the square inch, is 1149 units.

Then 97250 ÷ 1149 = 84 pounds of water which could have been evaporated to steam of 69 pounds pressure to the square inch.

The feed-water pumped into the boiler during the trial was 6988 pounds at 60° Fahr.

Then 6988 — 381 + 84 = 6691 pounds of water, the apparent evaporative capacity of the boiler during the trial.

The above calculation is based on the supposition that none of the water trapped was condensed from the steam in the steam-pipe.

The total quantities evaporated by each boiler, calculated as above, are as follows:

	Temp. of feed-water	Pounds of Water. Feed-water		Trapped.		Equiv. Water to Steam.		Apparent pounds of Water Evaporated
Exeter,	60°	6988	—	381	+	84	=	6691
Norris Iron Co.	57°	21466	—	148	+	40	=	21358
Harrison,	57°	21668	—	127	+	28	=	21569
Wiegand,	56°	32253	—	404	+	92	=	31941
Harrison,	53°	27373	—	286	+	65	=	27152

Percentage of Water carried over unevaporated.

	Water primed.			Total Feed-water in lbs.		Percentage of water primed.
Exeter, . .	381	× 100	÷	6988	=	5·45230
Norris Iron Co., .	148	× 100	÷	21466	=	0·68946
Harrison, . .	127	× 100	÷	21668	=	0·58612
Wiegand, . .	404	× 100	÷	32253	=	1·25200
Harrison, . .	286	× 100	÷	27373	=	1·04490

No means were provided in the trials for ascertaining the quantity of water carried over from the boiler, as distinguished from that condensed in the steam-pipes. There were some "dead ends" of pipes in which steam was condensed and these no doubt increased the amount of water trapped.

If we suppose no water was carried over direct from the boiler but that all the water trapped was condensed from the steam in the pipes, then the loss of dynamic value, say of the Wiegand steam boiler, will be as follows:

The water trapped during the experiment was 404 pounds weighing 59·838 pounds per cubic foot or 6·752 cubic feet of water.

The volume of saturated steam at a pressure of 76 pounds to the square inch above atmospheric pressure, compared with that of water, is 291·66, which, multiplied by 6·752 cubic feet, will be 1969·3 cubic feet of steam.

The volume of the steam cylinder including steam ports and clearances, was 3·5 cubic feet for each double stroke.

Then $1969{\cdot}3 \div 3{\cdot}5 = 554{\cdot}7$ revolutions, which the engine could have made with the steam of the trapped water, supposing the steam was admitted full stroke of the piston. But with one half expansion, the engine would have made $554{\cdot}7 \times 2 = 1109{\cdot}4$ revolutions with the steam of the trapped water.

The total revolutions of the engine by the counter was 60878 and $1109{\cdot}4 + 60878 = 61987{\cdot}4$ revolutions, which the engine could have made if the steam of the trapped water had been utilized. Percentage lost by condensation will then be $100 \times 1109{\cdot}4 \div 61987{\cdot}4 = 1{\cdot}79$ per cent.

The above calculation can be set up by a simple formula for the percentage lost by the steam of the trapped water, namely:

C = weight in pounds of a cubic foot of water, at 212°.

W = pounds of water trapped, or steam condensed in the steam pipes.

V = volume of steam compared with water, as determined by Fairbairn's experiments.

Q = volume of steam cylinder in cubic feet, for each double stroke or revolution.

N = number of revolutions which could have been made by the steam of the trapped water.

$$N = \frac{2WV}{CQ} = \frac{2WV}{59{\cdot}838 \times 3{\cdot}5} = \frac{WV}{104{\cdot}7}.$$

The loss by condensation of steam in the pipes, will then be, for the different boilers, as follows:

	REVOLUTIONS.	PERCENTAGE OF LOSS.
Exeter.	$N = \frac{381 \times 320{\cdot}74}{104{\cdot}7} = 1167{\cdot}2$	$\frac{100 \times 1167{\cdot}2}{36221 + 1167{\cdot}2} = 4{\cdot}26$
Norris Iron Co.	$N = \frac{148 \times 366{\cdot}24}{104{\cdot}7} = 517{\cdot}7$	$\frac{100 \times 517{\cdot}7}{58040 + 517{\cdot}7} = 0{\cdot}884$
Harrison.	$N = \frac{127 \times 300{\cdot}7}{104{\cdot}7} = 364{\cdot}75$	$\frac{100 \times 364{\cdot}75}{47212 + 364{\cdot}75} = 0{\cdot}766$
Wiegand.	$N = \frac{404 \times 291{\cdot}66}{104{\cdot}7} = 1109{\cdot}4$	$\frac{100 \times 1109{\cdot}4}{60878 + 1109{\cdot}4} = 1{\cdot}79$
Harrison.	$N = \frac{286 \times 313{\cdot}74}{104{\cdot}7} = 864{\cdot}83$	$\frac{100 \times 864{\cdot}83}{53022 + 864{\cdot}84} = 1{\cdot}604$

In comparing the two assumed cases, namely: first, that the trapped water was carried over mechanically from the boiler; and secondly, that it was condensed from steam within the pipes. The percentage of loss appears to be greater in the latter assumption, except in the case of the Exeter boiler. This may be accounted for by the supposition that a portion of the water passed with the steam through the engine.

Economy and Steaming Capacity.

The capacity of a boiler for making steam is generally determined from the quantity of water evaporated by a certain amount of coal consumed in a given time and is expressed by the number of pounds of water converted into steam by one pound of coal for its economy and the total amount of water evaporated in a given time as its steaming capacity.

But steam boilers when unprovided with superheating apparatus carry over mechanically large quantities of water unevaporated, as shown by these experiments.

The total quantity of water evaporated being divided by the amount of combustible used under each boiler during the trial, will give a measure of their relative economic efficiency.

Economic Efficiency.

	Total weight of water evaporated.		Combustible.		Economic efficiency in lbs.
Exeter,	6692	÷	722	=	9·26
Norris Iron Co.,	21358	÷	2824	=	7·56
Harrison,	21569	÷	2514	=	8·58
Wiegand,	31941	÷	3908	=	8·17
Harrison,	27152	÷	3384	=	8·02

These quantities are due under the conditions of the atmosphere at time of experiment, to wit: 73°, 70°, 80°, 73° and 53° Fahr., respectively, making the proper allowance for the highest temperature as a unit, we have as follows:

Apparent Economic Efficiency, with the Boiler Room Temperature Reduced to a Unit of 80° Fahr.

	Boiler room temperature at time of trial.	Evaporation per pound of combustible.		Factor for difference of temperature.		Apparent economical efficiency.
Exeter,	73°	9·26	×	1·013	=	9·38
Norris Iron Co.,	70°	7·56	×	1·018	=	7·69
Harrison,	80°	8·58				8·58
Wiegand,	73°	8·17	×	1·013	=	8·27
Harrison,	53°	8·	×	1·05	=	8·40

The Evaporative Value of the Fuel.

The total heat of a pound of water being divided by 966°, the latent heat of evaporation of a pound of water at 212° and multiplied by the pounds of water evaporated by a pound of combustible, gives the pounds of water which would have been evaporated at a temperature of 212° and under atmospheric pressure for each pound of combustible.

Equivalent evaporation of water at the pressure of the atmosphere and with the feed-water at a temperature of 212° Fahr.:

	Units of heat per pound.		Latent heat of steam.		Apparent pounds of water per pound of combustible.		Apparent pounds of water per pounds of combustible at 212°.
Exeter,	1149	÷	966°	×	9·38	=	11·16
Norris Iron Co.	1149	÷	966°	×	7·69	=	9·15
Harrison,	1153	÷	966°	×	8·58	=	10·23
Wiegand,	1154	÷	966°	×	8·27	=	9·87
Harrison,	1156	÷	966°	×	8·40	=	10·04

This is the most useful method of comparison for economy.

Percentage of Value.

Taking the above results, the Judges place them in the following order of Power, Economy of Fuel and Dynamic value :

Economy of Fuel.

	Economy of fuel.	Percentage of economical effect.
Exeter, ...	1	0·625
Norris Iron Co., . . .	5	0·512
Harrison, ...	2	0·572
Wiegand, ...	4	0·551
Harrison, ...	3	0·560

Dynamic Value.

	Horse-power rated by makers.	Average indicated horse-power.	Percentage of value.
Exeter, . . .	27	5·88	21·77
Norris Iron Co., . .	50	44·98	89·96
Harrison, . . .	60	61·35	102·00
Wiegand, . . .	80	69·93	80·74
Harrison, . . .	60	54·50	90·

These quantities are due under the conditions of the atmosphere, to wit: 73°, 70°, 80°, 73° and 53° Fahr.

BOILER ROOM RECORD OF "EXETER" CAST IRON SECTIONAL BOILER, G. B. BRAYTON'S PATENT, BY EVAPORATION, AT FRANKLIN INSTITUTE EXHIBITION, THIRTEENTH AND MARKET STS., PHILADELPHIA, NOVEMBER 7, 1874.

OBSERVATIONS.		Height of Water in Glass Gage.	STEAM PRESSURES Per Gages.			TEMPERATURES. FAHR.				POUNDS.			Intensity of Flue draft in inches.	REMARKS.
No.	Time.		Spring. lbs. per sq. inch	Merc'y lbs. per sq. inch	Me. col. lbs. per sq. inch	Feed Water.	Steam.	Flue.	Boiler Room.	Coal.	Feed Water.	Water carried over.		
	A	B	C	D	E	F	G	H	I	J	K	L	M	N
0.....	4.46 P. M.	Inches								Val. wood 20				Started Fire.
1.....	5.30 P. M.	—1.5	45	42		60		480	80	188	447	12		
2.....	6.00 "	—2.	40	39		60		480	80	68	377	9		
3.....	6.30 "	0	47	47		58		390	79		404	13		
4.....	7.00 "	0	46	46		60		410	76	75	322	13		
5.....	7.30 "	—1.	59	58		58		400	76		311	31		Sliced Fire.
6.....	8.00 "	—0.5	51	50		59	290	440	76	80	338	18		
7.....	8.30 "	—1.5	82	82	78	58	310	430	75		302	18		
8.....	9.00 "	—1	81	81		59	304	500	75	85	387	27		
9.....	9.30 "	—.5	79	79	69	58	303	460	74		422	25		
10.....	10.00 "	0	76	76	72	58	312	510	75	98	394	12		
11.....	10.30 "	0	69	70	65	57	290	520	73		368	2		
12.....	11.00 "	0	66	66	64	59	298	400	74		357	$1\frac{1}{2}$		Sliced Fire.
13.....	11.30 "	—0.75	59	59	54	60	292	440	72	68	227	33		
14.....	12.00 A. M.	—0.5	82	82	77	61	314	480	69		353	17		
15.....	12.30 "	—0.75	88	89		61	312	500	71	94	339	33		
16.....	1.00 "	0	85	86	81	63	310	460	70	49	345	9		
17.....	1.30 "	0	65	65	60	62	291	470	68	60	312	18		Sliced Fire.
18.....	2.00 "	0	75	76	70	65	312	420	67		304	26		
19.....	2.30 "	0.75	81	82	76	62	308	435	67	52	242	30		
20.....	3.00 "	+0.75	66	67	61	62	286	400	65		437	34		Trial ended.
Totals.....		—10	1342	1342	827	1200	4532	9025	1462	937	6988	381		Ashes and Coal, 215 lbs.
Average.....		—.53	67	67	69	60	302	451	73	93.7	698.8			
Errors.....														
Corrected Averages.....														

Wood used, 60 pounds; three pounds of wood equal one pound of coal.

ENGINE ROOM RECORD OF "EXETER" CAST IRON SECTIONAL BOILER, G. B. BRAYTON'S PATENT, BY EVAPORATION, AT FRANKLIN INSTITUTE EXHIBITION, PHILADELPHIA, THIRTEENTH & MARKET STREETS, NOVEMBER 7, 1874.

Observations.		Pressure.		Revolutions.			Indicator Diagrams.						
							Planimeter Areas.			Horse-Power.			
No.	Time.	B'rmtr in Inches of Merc'y	Steam per Gage in Pounds	Per Counter.	Av'rge per Minute	Actual count at time of taking diagram	Top of Cylndr	Bottom of Cylndr	Mean average pressure	Indicated.	Eff'ctv. per Brake.	Tempt. of Engine Room Fahr.	REMARKS.
	A	B	C	D	E	F	G	H	I	J	K	L	M
0.....	5.00P. M.	30·45	52	3372		81	2·82	2·18					Trial Commenced.
1.....	5.20P. M.	30·45	39	4158	39	61	1·52	1·10	8·91	7·60	6·84	80	
2.....	5.40 "	30·45	35·5	5224	54	55	1·35	·93	7·77	5·98	5·39		
3.....	6. "	30·46	40·5	6318	54	55	1·38	1·07	8·34	6·41	5·77	80	
4.....	6.20 "	30·46	43	7343	51	52	·96	·67	5·55	4·04	3·64	79	
5.....	6.40 "	30·49	48	8450	55	60	1·05	·73	6·06	5·09	4·59		
6.....	7. "	30·48	46·5	9483	51	58	·77	·76	5·19	4·21	3·79	76	
7.....	7.20 "	30·48	56	10738	64	69	1·03	·84	6·36	6·14	5·53		Slowed down.
8.....	7.40 "	30·48	46·5	11962	61	51	1·04	·83	6·36	4·54	4·09		Full Speed.
9.....	8. "	30·48	50	12820	43	57	1·03	·81	6·27	5·00	4·50	76	
10.....	8.20 "	30·5	79	13950	56	63	1·15	·87	6·87	6·05	5·45		
11.....	8.40 "	30·5	76	15490	77	80	1·17	·87	6·92	7·76	6·99		
12.....	9. "	30·5	81	16699	60	60	1·13	·86	6·78	5·69	5·13	75	
13.....	9.20 "	30·51	80	18135	72	88	1·31	1·03	7·95	9·79	8·82		
14.....	9.40 "	30·5	70	19743	80	80	1·23	·95	7·44	8·33	7·50		
15.....	10. "	30·5	74	20856	56	62	·97	·74	5·82	5·05	4·55	75	Counter Broke.
16.....	10.20 "	30·47	73	22512	82	100	1·20	·88	7·08	9·91	8·92		
17.....	10.40 "	30·49	67	23740	61	70	·73	1·02	5·94	5·82	5·24		
18.....	11. "	30·44	65	25115	69	80	·74	1·01	5·94	6·65	6·00	74	
19.....	11.20 "	30·48	58	26425	60	60	1·00	·72	5·85	4·91	4·42		
				2052									Changed Counter.
20.....	11.40P. M.	30·46	53	3052	50	50	·88	·70	5·37	3·75	3·38		
21.....	12. A. M.	30·47	81	4300	62	88	1·04	·84	6·39	7·87	7·09	70	
22.....	12.20 "	30·48	80	5729	71	60	·96	·64	5·40	4·53	3·92		
23.....	12.40 "	30·46	84	7140	70	85	1·22	·86	7·08	8·42	7·58		
24.....	1. "	30·46	85	7984	42	65	1·03	·80	6·21	5·65	5·09	70	
25.....	1.20 "	30·46	70·5	9410	71	50	1·02	·65	5·67	3·96	3·57		
26.....	1.40 "	30·46	67	10360	47	48	·82	·63	4·92	3·30	2.97		
27.....	2. "	30·46	75	11333	49	55	·87	·78	5·61	4·31	3·88	67	
28.....	2.20 "	30·46	77	12340	50	55	·91	·81	5·85	4.50	4·05		
29.....	2.40 "	30·46	69	13583	62	68	·92	·87	6·09	5·79	5·22		
30.....	3. "	30·46	70·5	15220	76	70	1·04	·64	5·70	5·58	5·03	64	Trial Ended.
Totals,		914·26	1950	36221	1795	1955	3149	2491	191·69	176·63	158·94	886	
Averages.		30·47	65·	60·37	60·	65·7	1·05	0·83	6·39	5·89	5·29	73·8	

BOILER ROOM RECORD OF NORRIS IRON CO.'S IMPROVEMENT ON ROGERS & BLACK'S BOILER, BY EVAPORATION, AT FRANKLIN INSTITUTE EXHIBITION, THIRTEENTH & MARKET STREETS, PHILADELPHIA, NOVEMBER 9, 1874.

OBSERVATIONS.		Height of Water in Glass Gage.	STEAM PRESSURES Pounds per Square In.			TEMPERATURES.				POUNDS.			Intensity of Flue Draft in inches.	REMARKS.
No.	Time.		Spring Gage.	Merc'y Gage.	Merc'y column	Feed Water.	Steam.	Flue.	Boiler Room.	Coal.	Feed Water.	Water carried over.		
	A	B	C	D	E	F	G	H	I	J	K	L	M	N
0....	7. P. M.		74	62			298	490	75	Val. wood 52				Trial Commenced.
1....	7.50 P. M.	0·	52	42	42	59	294	630	73	725	862	15		
2....	8.20 "	—1·	82	74	70	57	314	690	76		881			
3....	8.50 "	0·	50	40	37	56	282	669	74	273	1302	17		
4....	9.20 "	—3·	72	60	57	56	306	720	74	126	830			
5....	9.50 "	—2·	54	41	38	56	288	650	74	289	1212	18		
6....	10.20 "	—3·	83	73	71	56	320	710	72		903	10		
7....	10.50 "	—4·	76	64	60	56	310	710	68	126	998			
8....	11.20 "	—3·	83	72	72	56	318	710	72	124	1075	16		
9....	11.50 "	—3·	74	62	60	57	310	690	70	120	1367			
10....	12.20 A. M.	—3·	78	68	66	57	310	700	70	124	1106	16		
11....	12.50 "	—3·	72	60	56	57	306	710	70	239	1151			
12....	1.20 "	—4·	70	58	55	57	306	670	70		1176	18		
13....	1.50 "	—1·	58	48	45	57	292	680	70	277	1281			Sliced Fire.
14....	2.20 "	—4·	58	48	45	57	292	690	70	173	823			
15....	2.50 "	—3·	65	52	50	57	296	705	69	164	990	14		Sliced Fire.
16....	3.20 "	—4·	68	52	51	57	296	690	69	178	1056			
17....	3.50 "	—5·	71	60	53	57	306	700	69		1026			
18....	4.20 "	—4·	68	56	45	57	304	710	68	132	1108			
19....	4.50 "	—3·	58	46	45	57	292	700	68	180	1100			
20....	5.20 "	0·	72	60	63	57	308	690	64		1219	24		Trial Ended.
Totals.....		—53·	1364	1136	1081	1136	6050	13815	1410	3302	21466	148		Ashes and Coal, 478 lbs.
Averages.....		—2·65	68·2	56·8	54	56·8	302	690	70					

Wood used to start fires, 156 pounds; three pounds of wood equal one pound of coal.

ENGINE ROOM RECORD OF NORRIS IRON CO.'S IMPROVEMENT ON ROGERS & BLACK'S BOILER, BY EVAPORATION, AT FRANKLIN INSTITUTE EXHIBITION, THIRTEENTH AND MARKET STREETS, PHILADELPHIA, NOVEMBER 9, 1874.

OBSERVATIONS.		PRESSURE.		REVOLUTIONS.			INDICATOR DIAGRAMS.					Temperature of Engine Room.	REMARKS.
							PLANIMETER AREAS.			HORSE-POWER.			
No.	Time.	Barometer in inches of Mercury.	Steam per Gage in pounds	Per Counter.	Average per Minute	Actual count at time of taking diag'm.	Top of Cylinder.	Bottom of Cylinder.	Mean Average pressure	Indicated.	Effetv. Per Brake.	Fahr.	
	A	B	C	D	E	F	G	H	I	J	K	L	M
0.....	7. P. M.		64	26,640									Trial commenced.
1.....	7.50 P. M.		44	29,180	85	88	4·92	4·26	31·20	38·43	33·63	74	
2.....	8.20 "		76	32,542	112	100	4·89	4·04	33·30	42·42	37·12	75	
3.....	8.50 "		42	34,994	82	90	5·38	4·74	34·50	44·68	39·10	74	
4.....	9.20 "		62	37,924	98	112	5·61	4·03	32·70	57·27	44.87	75	
5.....	9.50 "		43	40,884	97	94	4·65	5·00	32·70	43·03	37·66	75	
6.....	10.20 "		75	43,825	99	110	5·11	4·21	31·20	48·04	42·04	73	
7.....	10.50 "		66	46,886	102	106	5·11	4·68	33·30	49·11	42·96	69	
8.....	11.20 "		74	49,878	100	109	6·05	5·50	39·30	59.97	52·48	72	
9.....	11.50 "		64	52,899	101	105	6·13	5·01	37·80	55·56	48·62	69	
10.....	12.20 A. M.		70	56,035	104	106	5·73	4·85	36·00	53·42	46·75	69	
11.....	12.50 "		62	59,007	99	106	5·64	4.59	34·80	51.64	45·19	70	
12.....	1.20 "		60	62,328	111	115	6 05	4·86	37·17	59.84	52·36	70	
13.....	1.50 "		50	64,700	76	94	4·84	5·20	34·20	44·70	39·20	70	
14.....	2.20 "		50	67,510	93	99	4·98	4·25	31·20	43.24	37·84	70	
15.....	2.50 "		54	70,334	94	101	5·22	4·32	32·40	45·81	40·09	70	
16.....	3.20 "		54	73,176	95	108	3·45	4 60	27 42	41.45	36·27	69	
17.....	3.50 "		62	76,235	102	104	4·54	4·16	29·10	42·36	37·07	69	
18.....	4.20 "		58	79,104	96	102	5·13	4·91	34·20	48·83	42·73	69	
19.....	4.50 "		48	81,882	93	96	4·82	4·51	31·80	42·13	36·87	68	
20.....	5.20 "		62	84,680	93	105	5·40	4·35	33·21	48·81	42·72	65	Trial ended.
Totals.....			1176	58,040	19320	205·00	103·64	92.07	667.50	959·74	835·55	1415	
Averages.....		30·45	58·8	96·73	96·6	102·5	5·182	4·603	33·37	47·98	41·77	70·5	

BOILER ROOM RECORD OF HARRISON SECTIONAL TEN SLAB BOILER, BY EVAPORATION, AT FRANKLIN INSTITUTE EXHIBITION, THIRTEENTH AND MARKET STS., PHILADELPHIA, NOVEMBER 10, 1874.

OBSERVATIONS.		Height of Water in Glass Gage.	STEAM PRESSURES per square inch.			TEMPERATURES. FAHR.				POUNDS.			Intensity of Flue draft in inches.	REMARKS.
No.	Time.		Spring Gage.	Mere'y Gage.	Merc'y column	Feed Water.	Steam.	Flue.	Boiler Room.	Coal.	Feed Water.	Water carried over.		
	A	B	C	D	E	F	G	H,	I	J	K	L	M	N
0.....	P. M. 2.00	Inches	80	79			290	370		Val. wood 52				Trial commenced.
1.....	2.30	—0.5	82	80		60	320	400	76	500	1627		·375	
2.....	3.00	0	82	80		57	320	390	78	111	1617		·375	
3.....	3.30	—3	83	84		56	322	380	80	146	1176	17	·375	No Steam to run Feed Pump to Speed.
4.....	4.00	—3	73	72		56	318	380	81	82	1372		·375	
5.....	4.30	—1	78	75		56	320	390	80	203	1599		·375	
6.....	5.00	—0.5	64	65		56	306	370	80	224	1028	20	·375	
7.....	5.30	0	70	67		56	316	360	81	172	1433		·375	
8.....	6.00	0	60	58	55	56	310	360	82		1262		·375	
9.....	6.30	—1	60	58	55	56	312	360	81	219	909	20	·375	Sliced Fires.
10.....	7.00	0	59	58		57	310	360	81	126	1047		·375	
11.....	7.30	—1	61	58	56	57	312	350	81	209	1087		·375	
12.....	8.00	—2	88	82		58	324	390	84	314	1140	21	·375	Pump stopped five minutes.
13.....	8.30	+1	82	78		58	320	370	81		1612		·375	Sliced Fire. Pump stopped five minutes.
14.....	9.00	+0.5	85	81		58	320	380	82	156	1522	16	·375	
15.....	9.30	0	81	78		56	320	380	81	126	1087	19	·375	
16.....	10.00	+1	82	78		57	318	370	80	160	1588	14	·375	Pump stopped ten minutes, water
17.....	10.30	—12.5	88	84		57	326	370	76	163	562		·375	out of sight, fire drawn, trial ended.
Totals.....		—24	1278	1236		967	5394	6360	1365	2963	21668	127	7·775	Ashes, about 450 lbs.
Averages.....		—1·3	75	73		57	317	374	80				·375	

Wood used to start fires, 158 pounds; three pounds of wood equal one pound of coal.
Experiment ended for want of steam to run feed-pump.

ENGINE ROOM RECORD OF HARRISON SECTIONAL TEN SLAB BOILER, BY EVAPORATION, AT FRANKLIN INSTITUTE EXHIBITION, THIRTEENTH AND MARKET STS., PHILADELPHIA, NOVEMBER 10, 1874.

OBSERVATIONS.		PRESSURES.		REVOLUTIONS.			INDICATOR DIAGRAMS.						
							PLANIMETER AREAS.			HORSE-POWER.			
No.	Time.	Barometer in inches of Mercury.	Steam Gage in lbs.	Per Counter.	Average per minute	Actual count at time of tak'g diag'm.	Top of Cylinder.	Bottom of Cylin'r	Mean average pressure.	Indicated.	Eff'etv. per Brake.	Tempt. of Engine Room Fahr.	REMARKS.
	A	B	C	D	E	F	G	H	I	J	K	L	M
0.....	2.00		81	93,820									Trial commenced.
1.....	2.30	30·	82	96,427	88	102	4·28	3·59	53·658	75.62	66·22	78	
2.....	3.00	30·	82	99,394	99	102	3·92	3·46	50·316	71·75	62·78	78	
3.....	3.30	30·	86	102,248	95	103	3·26	3·58	46·635	66·41	58·11	81	
4.....	4.00	30·	74	105,036	93	95	3·93	3·23	48·817	70·29	61·51	81	
5.....	4.30	30·	77	107,665	88	98	4·13	3·33	50·862	67·55	59·11	81	
6.....	5.00	29·98	67	110,300	88	101	3·46	2·88	43·226	59·32	51·91	81	
7.....	5.30	30·	69	113,112	93	102	3·57	2·86	43·840	61·90	54·17	82	
8.....	6.00	29·97	60	115,900	93	88	2·85	2·47	36·272	51·72	45·31	82	
9.....	6.30	29.97	60	118,350	82	87	2·98	2·53	37 607	46·26	40 48	82	
10.....	7.00	29·98	60	120,850	83	91	2·91	2·53	37·090	42 22	36·95	82	
11.....	7.30	29·97	60	123,300	85	93	3·15	2·26	36·885	46·92	41·06	82	
12.....	8.00	29·97	84	126,050	92	105	3·84	3·52	50·180	65·24	57 09	83	
13.....	8.30	29·96	80	129,155	103	106	3·64	2·90	44·589	65·45	57·29	82	
14.....	9.00	29·93	83	131,990	95	106	3·21	3·13	43·226	64·05	56·05	82	
15.....	9.30	29·93	80	135,080	103	103	3·45	2·98	43·839	64·96	56·84	82	
16.....	10.00	29·93	80	138,050	99	106	3·79	3·03	46·500	66·96	58·39	81	
17.....	10.30	29·93	86	141,032	100	106	3·84	3·03	46·839	68·41	61·86	80	Trial ended.
Totals.....		509·52	1270	47,212	1579	1694	6021·	51·310	760·381	1055·03	926·13	1380	
Averages.....		29·97	74.7	92·9	92·9	100	3·541	3·024	44·728	62·06	54·48	81	
Errors.....											·71		
Corrected Average.....									Half Piston-rod area off, 61·35				

BOILER ROOM RECORD OF TRIAL OF WIEGAND PATENT SECTIONAL BOILER, BY EVAPORATION, AT FRANKLIN INSTITUTE EXHIBITION, THIRTEENTH & MARKET STS., PHILADELPHIA, NOVEMBER 12, 1874.

OBSERVATIO		Height of Water in Glass Gage.	STEAM PRESSURES above atmosphere, per square inch.			TEMPERATURES. FAHRENHEIT SCALES.				POUNDS. AVOIRDUPOIS.			Intensity of Flue draft in inches of water.	REMARKS.
No.	Time.		Spring Gage.	Merc'y Gage.	Merc'y column	Feed Water.	Steam.	Flue.	Boiler Room.	Coal.	Feed Water.	Water carried over.		
	A	B	C	D	E	F	G	H	I	J	K	L	M	N
0....	9.35	3	90	74			200	540		Val. wood 85				Trial commenced.
1....	10.05	—1	90	84	82	65	319	610	68	876	1080	15		
2....	10.35	0	86	79		57	320	599	70	280	1582	18		
3....	11.05	0	79	70	70	56	316	620	66	152	1521	17		
4....	11.35	0	78	68	68	56	310	620	70	178	1539	18	·25	
5....	12.05	+0·5	87	80	78	56	322	650	72	122	1957	31	·125	
6....	12.35	0	85	78	76	55	318	630	71	288	1402	27	·25	
7....	1.05	0	81	74	72	56	316	660	74	229	1601	13	·25	
8....	1.35	0	87	78	78	56	324	640	77	148	1881	29	·25	
9....	2.05	—0·5	83	76	75	56	318	670	76	241	1480	17	·25	Sliced Fire.
10....	2.35	0	89	84	82	56	316	699	77	218	1590	17	·25	"
11....	3.05	+1	82	74	73	56	318	660	74	280	1858	16	.25	
12....	3.35	+1	83	78	75	55	320	670	72	103	1594	27	·125	
13....	4.05	+1	81	74	73	55	320	630	76	207	1616	23	·125	
14....	4.35	0	83	76	74	55	320	670	78	247	1324	18	·125	Sliced Fire.
15....	5.05	+1	87	80	77	55	324	630	78	179	1717	17	·125	"
16....	5.35	+2	89	82	81	55	320	660	78	197	1695	19	·125	Engine stopped one minute.
17....	6.05	+4	85	78	76	55	322	630	76	204	1869	13	·125	Sliced Fire.
18....	6.35	+0·5	86	80	88	55	316	650	74	192	1476	30	·25	
19....	7.05	+2	85	78	76	55	322	630	74	185	1661	13	·125	
20....	7.35	+3	72	64	62	55	314	610	74	36	1810	26	·125	Trial ended.
Totals.....		+14·5	1658	1535	1436	1120	6375	12848	1475	4647	32253	404	0·3125	Ashes and Coal, 739 pounds.
Averages.....		+0·725	83	76·7	75·6	56	318·7	642	73				0·184	

Wood used to start fires 255 pounds ; three pounds of wood equal one pound of coal.

ENGINE ROOM RECORD OF WIEGAND SECTIONAL STEAM BOILER, AT FRANKLIN INSTITUTE EXHIBITION, THIRTEENTH AND MARKET STREETS, PHILADELPHIA, NOVEMBER 12, 1874.

OBSERVATIONS.		PRESSURE.		REVOLUTIONS.			INDICATOR DIAGRAMS.						
							PLANIMETER AREAS.			HORSE-POWER.		Temperature of Engine Room Fahr.	REMARKS.
No.	Time.	Barometer in inches of Mercury.	Steam per Gage in lbs.	Per Counter.	Average per Minute	Actual count at time of tak'g diag'm.	Top of Cylinder.	Bottom of cylind'r	Mean effec've pres're	Indicated.	Eff'ctv.		
	A	B	C	D	E	F	G	H	I	J	K	L	M
0....	9.35			161,560									Trial commenced.
1....	10.05	30·2	80	164,330	92	104	3·15	3·21	43·36	62·23	54·45	70	
2....	10.35	30 22	77	167,292	99	97	3 65	3 52	48·88	65·44	57·26	70	
3....	11.05	30·2	70	170,410	104	106	3 49	3·29	46·22	67·61	59·16	71	
4....	11.35	30·16	69	173,711	110	102	3·50	3·37	46·84	65 93	55·69	71	
5....	12.05	30·19	79	176,983	109	113	3·93	3·68	51·88	80·98	70·86	71	
6....	12.35	30·19	77	180,185	107	110	3·82	3·54	50·17	76·17	66·65	73	
7....	1.05	30·2	73	183,410	107	105	3·31	3·54	46·70	67·66	59·21	73	
8....	1.35	30·2	79	186,544	104	110	3·66	3·57	49·29	74·82	64·47	74	
9....	2.05	30·2	75	189,556	100	106	3·61	3·45	48·82	71·41	62·49	74	
10....	2.35	30·2	84	192,974	114	118	3·42	3·39	46·43	75·60	66·15	74	
11....	3.05	30·2	73	195,995	101	99	3·72	3·61	49·94	68 27	59·74	74	
12....	3.35	30·2	76	199,010	100	95	3·86	3·77	52·02	69·19	60·54	73	
13....	4.05	30·21	74	201,868	95	95	3·74	3·57	49·84	64 02	56 02	73	
14....	4.35	30·24	75	204,720	95	96	3·75	3·61	50·17	66 46	58·16	72	
15....	5.05	30·25	79	207,600	96	103	3·69	3·74	50·65	71·99	63·	72	
16....	5.35	30·28	81	210,464	96	105	4·08	3·83	53·93	78 14	68·37	72	
17....	6.05	30·28	76	213,530	102	108	3·82	3·66	51·	76 01	66·50	71	
18....	6.35	30·3	79	216,574	101	102	4·05	3·75	53·18	74 85	65·50	71	
19....	7.05	30·3	77	219,511	98	100	3·94	3·73	52·29	72 16	63·14	71	
20....	7.35	30·3	62	222,438	98	87	3·09	2·99	41·45	49 76	43·54	70	Trial ended.
Totals, ...			1515	60,878	20,180	20,600	73·28	70·83	980·91	1398·70	1220·90	1440	
Averages....		30 22	75·7	101·46	101	103	3·664	3·54	49	69·93	61	72	

Indicator Diagrams 4·4 inches long, 49·15 pounds average pressure and 101·46 revolutions per minute =68·81 H. P.
" " " " 48·96 " " " " 103 " " =69·52 H. P.

BOILER ROOM RECORD OF HARRISON SECTIONAL TEN SLAB BOILER, BY EVAPORATION, AT FRANKLIN INSTITUTE EXHIBITION, THIRTEENTH & MARKET STS., PHILADELPHIA, NOVEMBER 13, 1874.

OBSERVATIONS		Height of Water in Glass Gage.	STEAM PRESSURES			TEMPERATURES. FAHR.					POUNDS.			Intensity of Flue Draft, in inches.	REMARKS.
No.	Time.		Spring Gage.	Merc'y Gage.	Merc'y column	Feed Water.	Steam.	Flue.		Boiler Room.	Coal.	Feed Water.	Water carried over.		
	A	B	C	D	E	F	G	H		I	J	K	L	M	N
	P.M.										Val. wood				
0.....	1.45	—1	82	82			284				64				Engine stopped 4 min'ts
1.....	2.15	—0·5	64	64		54	300	500	540	56	704	1307	23	·375	Engine stopped 5 min'ts
2.....	2.45	+0·5	82	82		53	314	530	570	56	61	1460	17	·375	
3.....	3.15	—2.	70	72		53	306	525	560	56	164	1171	18	·375	
4.....	3.45	—3.5	73	74		53	310	525	560	56	195	1194	13	·375	
5.....	4.15	—1.5	74	74		53	310	510	550	54	172	1574		·375	
6.....	4.45	—1.5	80	80		53	314	535	570	54	144	1513	16	·375	Sliced Fire
7.....	5.15	—1	74	72		53	312	520	580	54	158	1590	13	·375	
8.....	5.45	—2.	68	68		53	306	530	560	54	208	1231	19	·375	Sliced Fire
9.....	6.15	0	62	62		53	298	530	550	54	171	1375	12	·375	" "
10.....	6.45	—1.5	79	78		53	312	560	585	54	217	1246	18	·375	" "
11.....	7.15	—1.	70	72		53	308	550	570	54	243	1489	17	·375	" "
12.....	7.45	—1.5	79	80		54	316	550	590	52	200	1480	15	·375	" "
13.....	8.15	—2.	75	76		54	312	560	590	52	171	1545	19	·375	" "
14.....	8.45	—1.5	65	64		54	300	540	550	52	230	1459	11	·375	" "
15.....	9.15	+3.	66	66		54	296	530	570	52	172	1646	12	·375	" "
16.....	9.45	—1.5	66	68		54	302	530	570	52	188	964	12	·375	" "
17.....	10.15	—1.25	68	68		53	304	530	600	51	152	1410	15	·375	" "
18.....	10.45	—1.	60	60		54	296	510	560	52	211	1183		·375	" "
19.....	11.15	—2.	61	62		53	300	510	560	51	157	1231	18	·375	
20.....	11.45	—1.	50	48		53	286	465	521	51	105	1305	18	·375	Trial Ended.
Totals..		22·75	1386	1390		1068	6102	21841		1067	4087	27373	286	7500	Ashes and Wood, 703 lbs.
Averages		1·2	69·3	69·5		53	305	546		53				·375	
Errors				2.											
Corrected Average				71·5											

Value of wood used to start fire 192 pounds; three pounds of wood equal one pound of coal.

ENGINE ROOM RECORD OF HARRISON SECTIONAL TEN SLAB BOILER, BY EVAPORATION, AT FRANKLIN INSTITUTE EXHIBITION, THIRTEENTH AND MARKET STS., PHILADELPHIA, NOVEMBER 13, 1874.

OBSERVATIONS.		PRESSURES.		REVOLUTIONS.			INDICATOR DIAGRAMS.					Temperature of Engine Room Fahr.	REMARKS.
							PLANIMETER AREAS.			HORSE-POWER.			
No.	Time.	Barometer in inches of Mercury.	Steam per Gage in lbs.	Per Counter.	Average per minute	Actual count at time of tak'n diag'm.	Top of Cylinder.	Bottom of cyl'nd'r	Mean Average press're.	Indicator.	Eff'etv. per Brake.		
	A P.M.	B	C	D	E	F	G	H	I	J	K	L	M
0....	1·45	30·3	78	232,549								60	Trial commenced.
1....	2·15	30·9	61	234,953	80	95	3·04	2·87	40·296	53·52	46·90	59	Eng. stopped 4 min. on account of
2....	2·45	30·4	77	237,364	80	107	3·73	3·50	49·296	73·74	64·53	59	belt slipping and running off.
3....	3·15	30·4	68	240,266	97	98	3·19	3·21	43·636	59·78	50·36	58	Stopped 5 minutes as above.
4....	3·45	30·4	71	242,808	85	85	3·48	3·42	47·046	55·90	49·	58	
5....	4·15	30·44	71	255,381	88	88	3·57	3·33	47·046	57·88	50·66	58	
6....	4·45	30·44	75	258,018	87	92	3·63	3·82	50·796	65·33	57·17	56	
7....	5·15	30·45	69	250,653	87	82	2·95	3·38	43·159	49·48	43·30	57	
8....	5·45	30·47	64	253,184	84	90	3·13	3·21	43·227	54·39	44·20	58	
9....	6·15	30·48	60	255,757	86	86	3·01	2·96	40·704	48·94	42·83	57	
10....	6·45	30·5	74	258,450	90	99	3·55	3·60	48·750	67·47	59·04	57	
11....	7·15	30·5	68	261,247	93	92	3·29	3·25	44·591	57·35	50·18	57	
12....	7·45	30·52	77	264,166	97	100	3·76	3·70	50·463	70·55	61·73	57	
13....	8·15	30·53	73	267,098	97	95	3·58	3·46	48·000	63·75	55·79	56	
14....	8·45	30·54	62	269,811	91	85	2·99	2·82	39·613	46·61	40·79	56	
15....	9·15	30·54	64	272,459	88	90	3·07	2·93	40·909	51·47	45·04	56	
16....	9·45	30·55	66	275,174	91	92	3·16	3·06	42·409	54·54	47·73	55	
17....	10·15	30·56	65	277,925	92	92	3·09	3·06	41·932	53·93	47·19	55	
18....	10·45	30·56	59	280,508	86	86	2·81	2·67	37·363	44·92	39·35	54	
19....	11·15	30·56	60	283,116	83	85	2·66	2·75	36·886	43·83	38·36	54	
20....	11·45	30·56	50	285,571	82	75	2·27	2·29	31·091	32·60	28·53	52	Trial ended.
Totals.....		613·00	1330	53022	1764	1814	62·960	63·29	867·213	1105·98	962·68	1129	
Averages....		30·65	66·7	88·37	88·2	90·7	3·148	3·164	43·36	55·29	48·13	56·4	
Corrected Average.....										54·5	47·7		

STEAM LINE DIAGRAMS.—NOS. 2 AND 3.

Fluctuations of the steam line in the boilers during trials:—

The steam line of the "Exeter" commenced with 80 pounds per square inch, and at the second observation had fallen to 39 pounds, and then it gradually rose to 82 pounds, at the seventh observation, and again fell to 59 pounds, at the 13th, and then commenced rising until the 15th observation it had reached 89 pounds and was maintained above 80 pounds until the last observation, at which time it fell to 67 pounds, the average pressure during the time of trial.

The Norris Iron Co. Boiler average steam pressure during the trial was 56 pounds per square inch. The highest pressure reached was 74 pounds, and the lowest 40 pounds per square inch, not reaching the limit, 80 pounds, once during the experiment.

The Harrison Boiler test averaged 73 pounds. The lowest pressure being 38, and the highest 84 pounds per square inch. At the 17th observation the trial ended for the want of water.

The Wiegand Boiler maintained the best steam line of all the boilers on trial, averaging 76·71 pounds per square inch. The highest point reached was at the 1st and 10th observations, being 84 pounds, and the lowest at the end of the experiment, it had fallen to 64 pounds per square inch.

Harrison Boiler, 2d trial, averaged 71.5 pounds. In the first part of the experiment, the steam was evenly maintained, but towards the close and after the 13th observation it gradually fell to 48 pounds per square inch at the last observation.

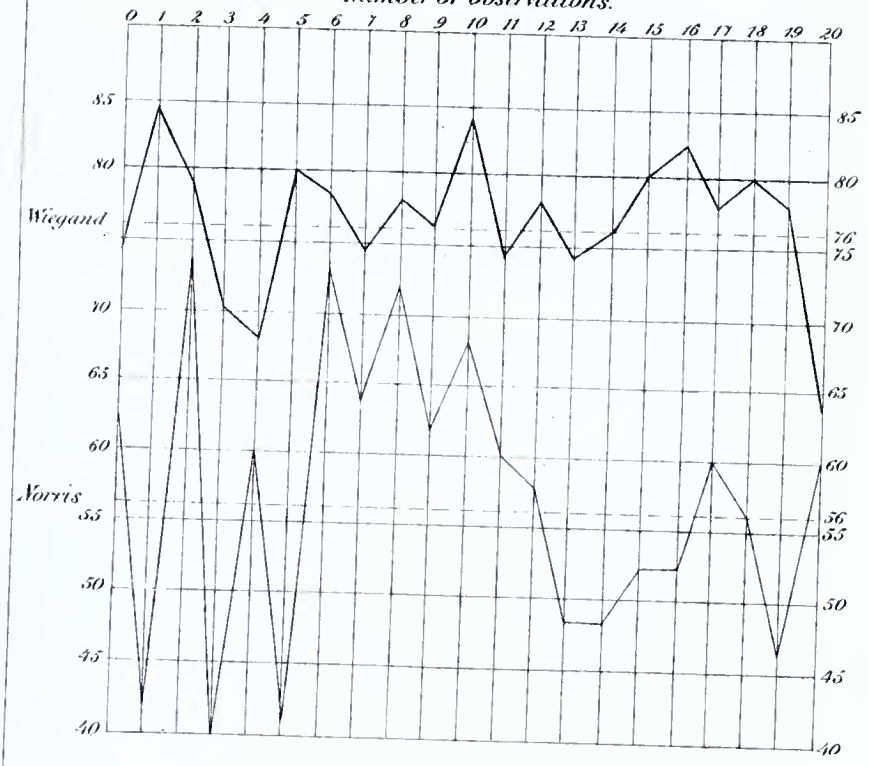
These diagrams give the best idea of the skill of the fireman during the experiments, as will be seen in the Wiegand diagrams. The firing during the trial was commented on by all, especially those representing the other boilers, who were unanimous in their praise of the management and skill shown in it.

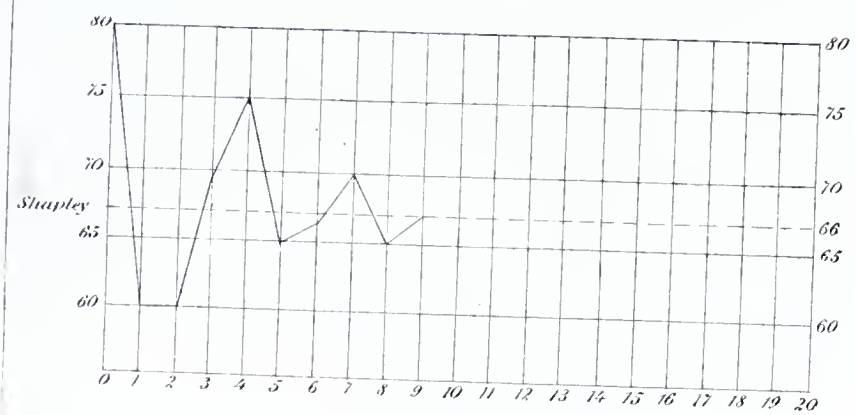
In considering the consumption of fuel per hour, per horse power, it should be borne in mind that in the use of high pressure engines, it is customary to heat the feed-water by the exhaust steam, thereby increasing its temperature to about 180 degrees, and the difference of saving of fuel by using feed-water at 60 degrees and at 180 degrees is about 10 per cent. of the coal required to evaporate it into steam, or a given weight of coal being used in both cases, about 15 per cent. more would result from feed-water of a high temperature than that of cold.

No. 4.

Profile of steam pressure in Boilers.

Number of Observations.



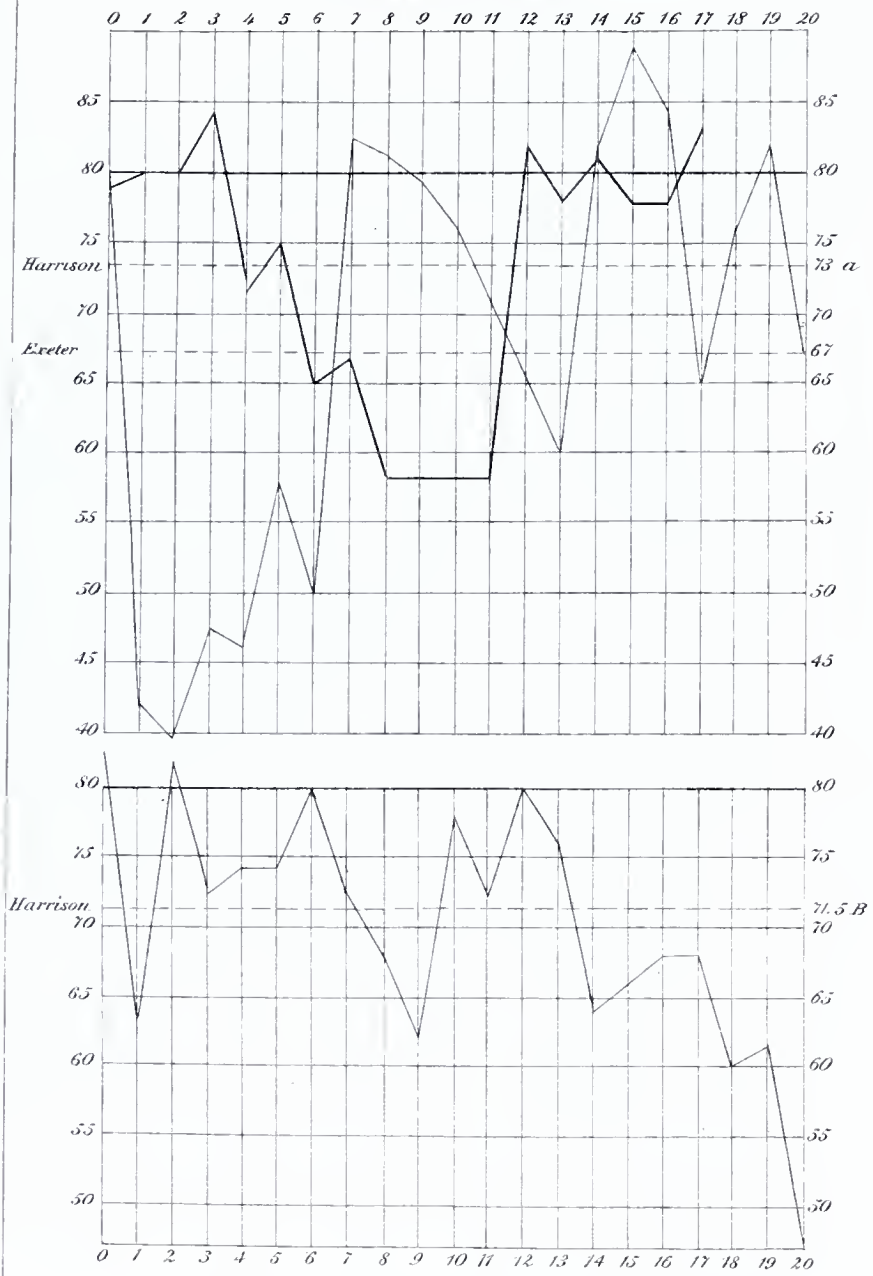


Wiegand, Norris Iron Cos, & Shapley.

No. 3

Profile of steam pressure in Boilers.

Number of Observations.

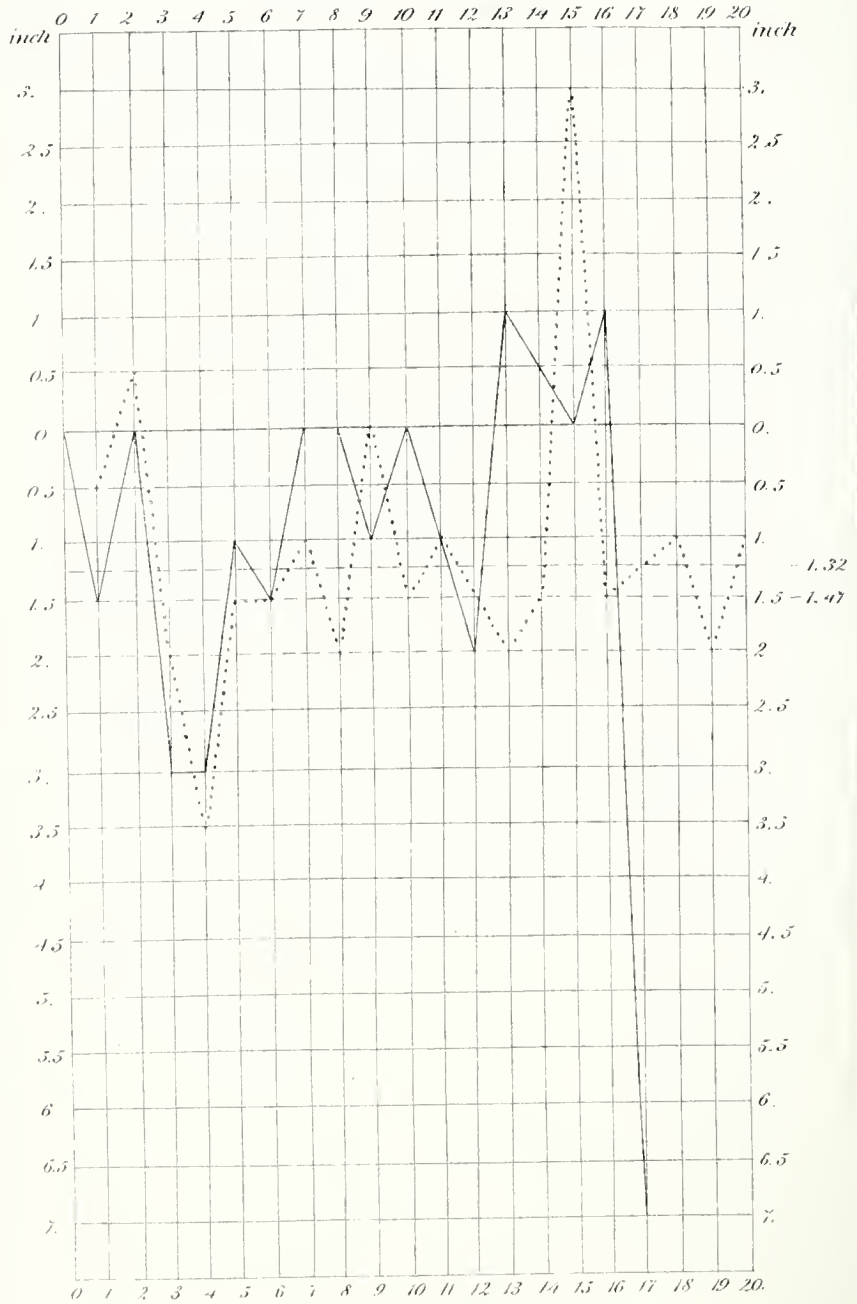


a Harrison 1st trial, Exeter,- B. Harrison 2nd trial.

No 1

Harrison Boiler Water level during trial.

Number of Observations.

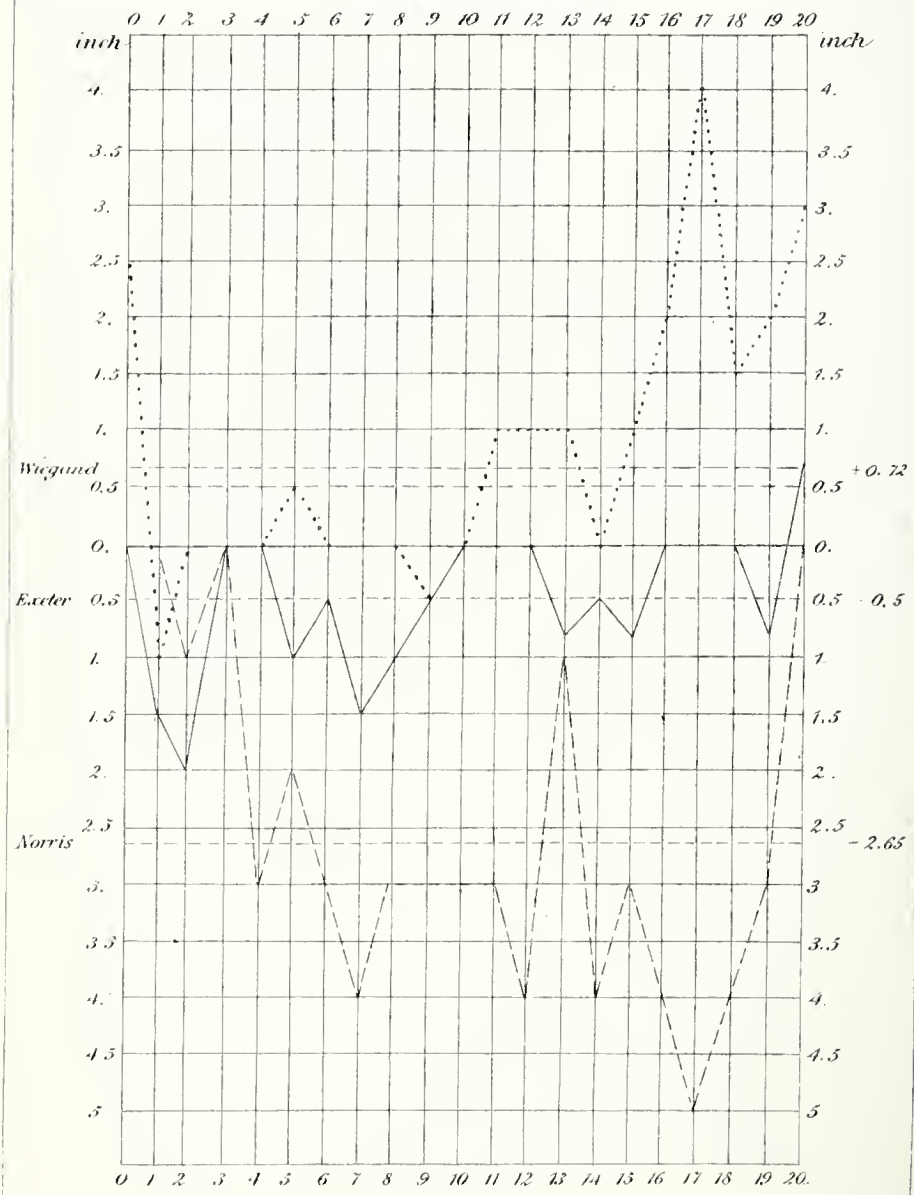


1st trial Plain black line

2nd " Dotted line.

No. 1.

Exeter, Norris Iron Co, & Wiegand Boilers.
Water level during trial.



Exeter Plain black line.

Norris Iron Co. Dash line.

Wiegand Dotted line.

Water Level Diagrams.

Fluctuations of the Water Line in the Boilers during Trials.

These diagrams illustrate in a most effective and faithful manner the fluctuations of the water line during each half hour of the trials, and form an interesting supplement to the records of the boiler trials.

The design of these diagrams will be readily understood, and require but few words of explanation. The perpendicular lines divide the time of trial into the number of observations, leaving one space for every half hour record and the horizontal lines indicate the number of inches of water from 0 (zero) water level above or below the same.

The water as it varies is represented by the various lines which run irregularly from left to right and which show the highest and lowest range of each observation.

The water level of the "Exeter" boiler, for example, in diagram Number one, is represented by a *plain black line* running below the zero level of the diagram, and its average height is marked "Exeter" — 0.53 inches in the margin. In the first space to the left, which represents the first half hour, this line falls to one and one-half inches and in the second space to two inches and in the third space up again to zero or the starting point.

The Norris Iron Company's boiler water level on same diagram is represented by a *dash line* and the Wiegand boiler by a *dotted line.*

Diagram Number two represents the first and second trial of the Harrison boiler, the former in a *plain black line* and the latter in a *dotted line.*

The diagram exhibits with all the accuracy of the records the range of the water level at each observation and it gives at a glance a far better general idea of the water level during each trial, than could be obtained from any compilation of mere figures, however carefully arranged or studied.

The range of the water level is shown to have been generally downward, with the exception of the Wiegand boiler, which in only two instances, the first and eighth observation, was one inch and one half inch respectively below the zero level, its average height being + 0·72 inches above the same.

RESULTS OF THE TRIALS OF STEAM BOILERS AT THE EXHIBITION OF THE FRANKLIN INSTITUTE, PHILADELPHIA, NOVEMBER,, 1874.

		Exeter.	Nor.I Co.	Harrison.	Wiegand	Harrison.
1	Name of boiler on trial					
2	Date of trial	Nov. 7th	Nov. 9th	Nov. 10	Nov. 12	Nov. 13
3	Duration of trial in hours	10	10	8·5	10	10
	DESCRIPTION OF BOILERS.					
4	Rated horse-power by makers	27	50	60	80	60
5	Grate surface in square feet	12	24	30	30·8	30
6	Water heating surface in square feet	414	595	783	996	783
7	Steam " " " " "	170	82	343	44	343
8	Area of water line " " "	11	14·5	17	19	17
9	Height of chimney in feet from grate	48	50	54	56	54
10	Ratio of Grate to Heating Surface	1 to 34·5	1 to 25	1 to 26	1 to 32	1 to 26
	PRESSURES.					
11	Steam in pounds per square inch Spring Gage	67	63	75	84	69
12	" " " " " Mercury "	67	56	73	76	69
13	" " " " " " Column	69	54		75	
14	Barometer in inches of Mercury	30·47	30·45	29 97	30·22	30·65
	TEMPERATURES. (Fahrenheit Scale.)					
15	Average temperature of Boiler Room	73	70	80	73	53
16	" " " Steam in boiler	302	302	317	318	305
17	" " " Boiler flue	481	690	374	553	546
18	" " " Feed-water	60	·56	57	56	53
	COAL AND ASHES.					
19	Total weight of Buck Mountain Coal, in pounds, including value of wood to start fires	937	3302	2963	4647	4087
20	Average weight of coal consumed per hour in pounds	93·7	330	348	464	408
21	Percentage of ashes and fine coal withdrawn in pounds from ash pit	22·94	14·4	15·1	15·9	17·2
22	Total weight of combustible in pounds	722	2824	2514	3908	3384
23	Average " " " per hour, in pounds	72	282	295	391	338
	WATER.					
24	Total weight of water, in pounds, evaporated at observed pressure and temperature	6988	21466	21668	32253	27373
25	Pounds of water carried over unevaporated	381	148	127	404	286
26	Apparent water, in pounds, evaporated at observed pressure and with a boiler room tempt. of 80° Fahr	6779	21742	21369	32366	28509
	PERFORMANCE OF BOILERS.					
27	Apparent evaporation of water per pound of coal at the observed pressure	7·14	6·46	7·24	6·87	6·64
28	Apparent equivalent evaporation at a temperature of 212° Fahrenheit, and under atmospheric pressure for each pound of coal	8·43	7·62	8·66	8·18	7·90
29	Apparent evaporation of water per pound of combustible, at observed pressure	9·26	7·56	8·58	8·17	8
30	Apparent equivalent evaporation at a temperature of 212° Fahrenheit and under atmospheric pressure for each pound of combustible	**11·16**	**9·15**	**10·23**	**9·87**	**10·04**
31	Apparent evaporation per hour, per square foot of grate surface	56·6	93·4	84·3	105	95
32	Apparent evaporation per hour, per square foot of heating surface	1·61	3·58	3·24	3·2)	3·46
33	Square feet of water heating surface required to evaporate one cubic foot of water per hour	38·8	15·3	19·2	19·4	18
34	Efficiency: apparent evaporation of fuel divided by theoretical	·625	·512	·572	·551	·589
	ENGINE.					
35	Diameter of Cylinder in inches	14	14	14	14	14
36	" " Piston Rod in inches	2·375	2·375	2·375	2·375	2·375
37	Stroke of the " " "	18	18	18	18	18
38	Mean net area of piston, less half piston rod area, in square inches	152	152	152	152	152
39	Space swept through by piston in cubic feet	1·582	1·582	1·582	1·582	1·582
	REVOLUTIONS.					
40	Total revolutions in ten hours	36221	58040	47212	60878	53022
41	Average revolutions per minute	60·	96·7	92·5	101·4	88·3
42	Av'rge No. of revolutions at time of taking diagram	65·7	101·5	100	103·	90·7
	DISTRIBUTION OF THE POWER.					
43	Average indicated horse-power	**5·88**	**47·98**	**61·35**	**69·93**	**54·50**
44	Effective horse-power	5·29	41·77	54·48	61·12	47·70
	COST OF POWER.					
45	Water per hour per indicated horse-power in pounds	115·29	45·54	34·83	46·84	52·31
46	Coal " " " " " "	16	6·91	5·67	6·65	7·50
47	Coal per hour per total horse-power	5·24	4·52	4 02	4.80	5·02
48	Combustible per hour per indicated horse-power in pounds	**12·28**	**5·91**	**4·80**	**5·59**	**6·21**

It is to be regretted that the boilers tested were not more nearly equal in power. No time need then have been occupied in changing the preparations made for the smaller boilers to suit the larger ones, and the condition imposed upon the judges by the printed rules, viz., "To test the dynamic value through one and the same engine," would not have resulted to the disadvantage of any not sufficient to supply steam to an engine necessarily of the capacity to work off all that could be generated by the largest one.

This will be manifest when it is considered that the loss of heat by radiation from cylinder and pipes was the same in all the trials, and that there is always a greater proportional radiation from the setting of a small boiler than from that of a large one.

A comparison of the relative proportion of condensation to the total amount of water evaporated, is shown by the following figures:

Exeter,	$\frac{1}{18{\cdot}36}$
Norris I. Co.	$\frac{1}{145}$
Harrison,	$\frac{1}{170{\cdot}61}$
Wiegand,	$\frac{1}{79{\cdot}83}$
Harrison,	$\frac{1}{95{\cdot}7}$

These figures show a condensation in the case of the "Exeter" more than four times that of the "Wiegand," which is the next highest; and nearly ten times that of the lowest.

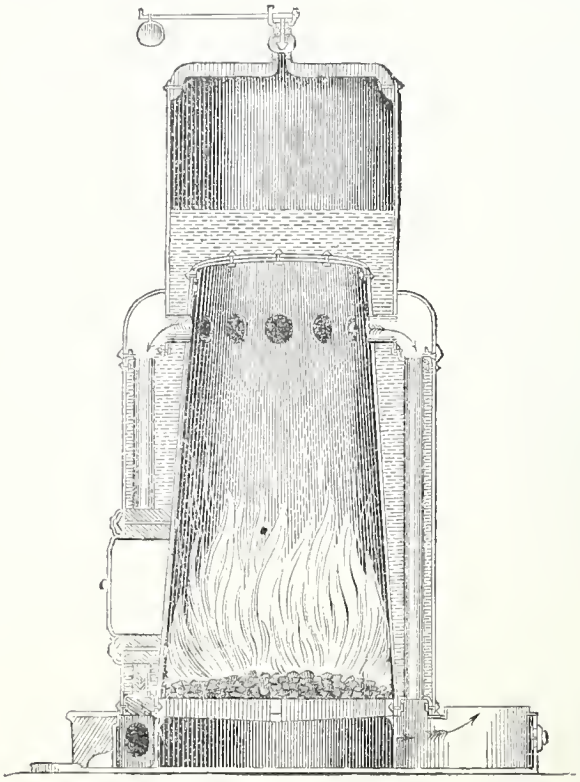
But another deficiency of still greater magnitude is to be seen by a comparison of the figures representing the ratio of power developed by the steam after generation. Under the head of "cost of power," the "Exeter" is charged with 115·29 lbs. of water per hour to the indicated horse-power, while the average of all the others is but 44·88 lbs.; the highest being 52·31 lbs.

The greater irregularities of the pressure, power, etc., shown on the "Exeter" record, resulted, without doubt, from the inefficiency of the fireman, which the committee could not fully control.

In view of these unusual discrepancies, the propriety of throwing out the "Exeter" record from the report, was under consideration by the judges; but as such a course might be misinterpreted, it was determined to retain it and make the foregoing statement.

The Judges regret that the first trial of the Harrison boiler was interrupted after a run of $8\frac{1}{2}$ hours, from causes over which the Judges and those in charge had no control, (as the conditions of the atmospheric temperature, etc., were exactly the same in all respects as those of the other boilers on trial; whereas in the last trial the temperature of the air had fallen 27 degrees, and the Exhibition being over, the confusion due to the removal of goods and to other incidental causes were great drawbacks to the obtaining of a favorable result.)

THE SHAPLEY PORTABLE ENGINE AND BOILER.



The engine is of the plain three port slide valve pattern, without lap on the valve. It is not attached to the boiler, but stands upright on the base, which also supports the boiler and is provided with wheels, making the whole affair semi-portable. The exhaust steam passes through a feed-water heater on its way to the chimney.

The Boiler.

The boiler is vertical in two cylindrical sections, the lower one 32 inches diameter and 38 inches high; the upper section is 24 inches diameter and 29 inches high, the two being connected together by a horizontal tube sheet **Z** shaped in section.

The fire box is 48 inches high, and conical in form; 24 inches diameter at the base where it is joined to the lower section by a tube sheet and 17½ inches diameter at the top, which is convex and stayed.

Below the crown sheet of the fire box and above the lower edge of the upper section, a series of 13 3-inch horizontal fire tubes is arranged radially and secured to both.

In the annular space between the fire box and the lower section, and connecting the two tube sheets, is secured a series of 26 2-inch vertical fire tubes.

The annular space above the outlets of all these tubes is confined by a movable cover made in two parts to facilitate the cleaning of the tubes and below the vertical tubes communicate with an annular space around the ash pit in the base of the boiler, from which the products of combustion escape by a pipe to the chimney.

The water level is maintained over the crown of the fire box, covering all the tubes and wetting all the fire surface.

The upper section has a cast head provided with the usual nozzles and valves, and a fire door frame penetrates the lower section to the fire box, which latter is fitted with a circular grate in the usual way.

The amount of heating surface is as follows:

Area of water heating surface of the fire box in square feet, ...	23
Area of water heating surface of the tubes in square feet, ...	46·5
Total area of heating surface in square feet, . .	69·5

Area of horizontal water line in square feet,	3·14
Fire grate surface in square feet,	3·14
Ratio of grate to fire surface,	1 to 22·1

Results of the Trial of the Shapley Portable Engine and Boiler at the Franklin Institute Exhibition, 1874.

BOILER PRESSURES.

Steam per square inch, in pounds,	67·00
Barometer, in inches of mercury,	30·30

TEMPERATURES (FAHRENHEIT SCALE).

Temperature of the room,	84·00
Temperature of the feed water,	177·00

COAL AND ASHES.

Total weight of Buck Mountain coal in pounds, including wood to start fire,	253·00
Average weight per hour in pounds,	84·31
Percentage of ashes and fine coal withdrawn, in pounds, from ash pit,	16·18
Total weight of combustible in pounds,	212·00
Average weight of combustible in pounds per hour,	70·00

WATER.

Apparent weight of water evaporated at observed temperatures in pounds,	1899·00

PERFORMANCE OF THE BOILER.

Apparent evaporation of water per pound of coal at observed temperatures,	7·49
Apparent evaporation of water per pound of coal at 212° Fahrenheit,	8·93
Apparent evaporation of water per pound of combustible at observed temperatures,	7·93
Apparent evaporation of water per pound of combustible from and at 212°,	9·46

Apparent evaporation at observed temperatures per square foot of grate surface,	21·40
Apparent evaporation at observed temperatures per square foot of heating surface,	7·91

ENGINE.

Duration of trial in hours,	3·00
Diameter of cylinder in inches,	6·00
Diameter of piston rod in inches,	1·25
Stroke of the piston in inches,	10·00

REVOLUTIONS.

Total number of revolutions in three hours,	31150·00
Average number of revolutions in one minute,	173·00

PRESSURES PER INDICATOR.

Initial pressure in cylinder per indicator in pounds,	58·40
Mean terminal pressure in cylinder in pounds,	3·25
Mean effective pressure in cylinder in pounds,	46·53

DISTRIBUTION OF THE POWER.

Indicated horse-power,	11·35
Horse-power per dynamometer,	10·40
Percentage of power lost by friction,	·09

COST OF THE POWER.

Water per hour per indicated horse-power in pounds,	55·70
Water per hour per net horse-power in pounds,	60·00
Coal per hour per indicated horse power in pounds,	7·51
Combustible per hour per indicated horse-power in pounds,	6·30

RECORD OF THE SHAPLEY STEAM ENGINE BY INDICATOR, AND BOILER BY EVAPORATION, AT FRANKLIN INSTITUTE EXHIBITION, THIRTEENTH AND MARKET STS., PHILADELPHIA, NOVEMBER 6, 1874.

OBSERVATIONS.		PRESSURE.		REVOLUTIONS.		POUNDS.		TEMPERATURES Fahr. Scale.		Mean aver'ge pressure, per Indicator	HORSE-POWER.		Height of Water in Glass Gage.	REMARKS.
No.	Time.	Barometer in inches Mercury.	Steam per Gage in lbs.	Per Counter.	Ave'ge per Minute	Coal.	Feed Water.	Feed Water.	Boiler Room.		Per Indicator.	Effect'v.		
	A	B	C	D	E	F	G	H	I	J	K	L	M	N
0.....	1.55		80	41,784		Val. wood 5			78					Trial commenced.
1.....	2.15	30·3	60	45,031	162·3	105	435	184	82	38·18	8·68	7.82	+1	Fire lighted at 1.50.
2.....	2.35	"	60	48,316	164.2	22	80	135	83	37·9	8·64	7·78	0	
3.....	2.55	"	69	51,712	169·8	20	135	172	85	46·4	10·95	9·86	—2	
4.....	3.15	"	75	55,274	178·1	10	215	185	85	54·7	13·56	12·21	+1	
5.....	3.35	"	65	58,987	185·6	17	244	184	85	46·95	12·20	10·98	0	
6.....	3.55	"	66	62,785	189·9	26	183	188	85	51·30	13·44	12·10	0	
7.....	4.15	"	70	66,325	177·	14	239	184	85	53·90	13·31	11·98	0	
8.....	4.35	"	65	69,561	161 8	25	188	179	85	49·05	11·13	10·	+1·5	
9.....	4.55	"	67	72,934	168·6	9	180	181	85	47·35	11·07	10·30	0	Trial ended.
Totals.....		270·27	597	31,150	31150	253	1899	1592	760	425·73	102·98	93·03	+1 5	Ashes, 41 pounds.
Averages.....		30·3	66	173	173			177	84	47·3	11·44	10 3	+0·16	

RECORD OF ANDREW WATSON'S SLIDE VALVE ENGINE, BY PRONY'S FRICTION BRAKE,

AT FRANKLIN INSTITUTE EXHIBITION, PHILADELPHIA.

OBSERVATIONS.

No.	Time of commencement.	Time of ending.	Duration in minutes.	Whole No. of Revolutions	No. of Revolutions per minute.	Weight in Pounds.	Circumference of Circle.	Horse-Power.	Indicated Horse-Power. Effective.	Percentage of useful Horse-Power.	Name of Boiler.
	A	B	C	D	E	F	G	H	I	J	K
0											
1	3·48	3·53	5	533	106·6	250	66	53 3	60 47	0·88	Harrison.
2	4·04	4·09	5	593	118·6	275	66	65·23	75·38	0 86	"
3	4·20	4·24	4	483	120·75	275	66	66·412	75 80	0·87	Wiegand.
4	4 30	4·33	3	302	100 66	200	66	40·264	45·11	0 89	"

Coal.

The coal used during these trials was from the Buck Mountain Coal Company. It was of an excellent quality and these results are therefore of value for *comparison*. The analysis of this coal was kindly made by Dr. Charles M. Cresson, at his laboratory and is as follows:

Office and Laboratory of Dr. Charles M. Cresson,
No. 417 Walnut Street,

Philadelphia, Jan. 9th, 1875.

W. Barnet LeVan, Esq.—Dear Sir:—The samples of coal sent from the Franklin Institute Exhibition have been examined in my laboratory by Mr. Herman Haupt, Jr., under my immediate supervision, and the following results obtained:

Anthracite Coals.

Sample No. 1259—Ash, . . 11·94 per cent.
Nearly white, powdery and does not readily form clinker.

Heating Power.

One pound of coal evaporated 11.66 pounds of water, a first-class steam anthracite, can be readily burned in any form of boiler, but best in those with furnace large in comparison to flue surface. Better fitted for steam than for smelting.

Analysis of No. 1291, *Second Coal Sent for Analysis.*

Heating power, . . 11·88 pounds of water.
Ash, ... 9·66 per cent.
This coal does not materially differ from No. 1259.

To convert these results into practical use, there must be deducted from the amount of water evaporated by one pound of coal, the amount that would be evaporated by the heat absorbed by the ash, and also that lost by radiation, and that carried off by the products

of combustion and draft through the stack. The latter items will vary with each boiler used and their relative amounts express (inversely) the economic effect obtained.

With the best stationary boilers, thoroughly protected from radiation, 70 per cent. of the full heating power of the fuel may be enjoyed; with locomotives from 40 to 45 per cent. of the full heating power.

The percentage of ash does not always represent the percentage of loss of heat by the ash, as it frequently happens with fine pulverulent ash and tubular boilers that a considerable amount of the ash passes through the tubes and yields up heat otherwise lost. The coal sent by you could by care be made to give results as below:

Ash, ...	6	per cent.	of heat.
Air in Chimney and Radiation,	24	"	"
Steam, ...	70	"	"

That is, one pound of coal can evaporate 8.162 pounds of water to (dry) steam per pound of fuel burned.

Very Truly Yours,

CHARLES M. CRESSON, M.D.

VALUE OF THE COAL USED.

The theoretic heating value of a pound of this coal, provided all waste could be prevented, would be equivalent to evaporating 11·66 pound of water at the temperature of 212° Fahrenheit, and under atmospheric pressure, or one pound of this coal, burned without waste, would be capable of raising the temperature of 11,263·56 pounds of water one degree Fahrenheit.

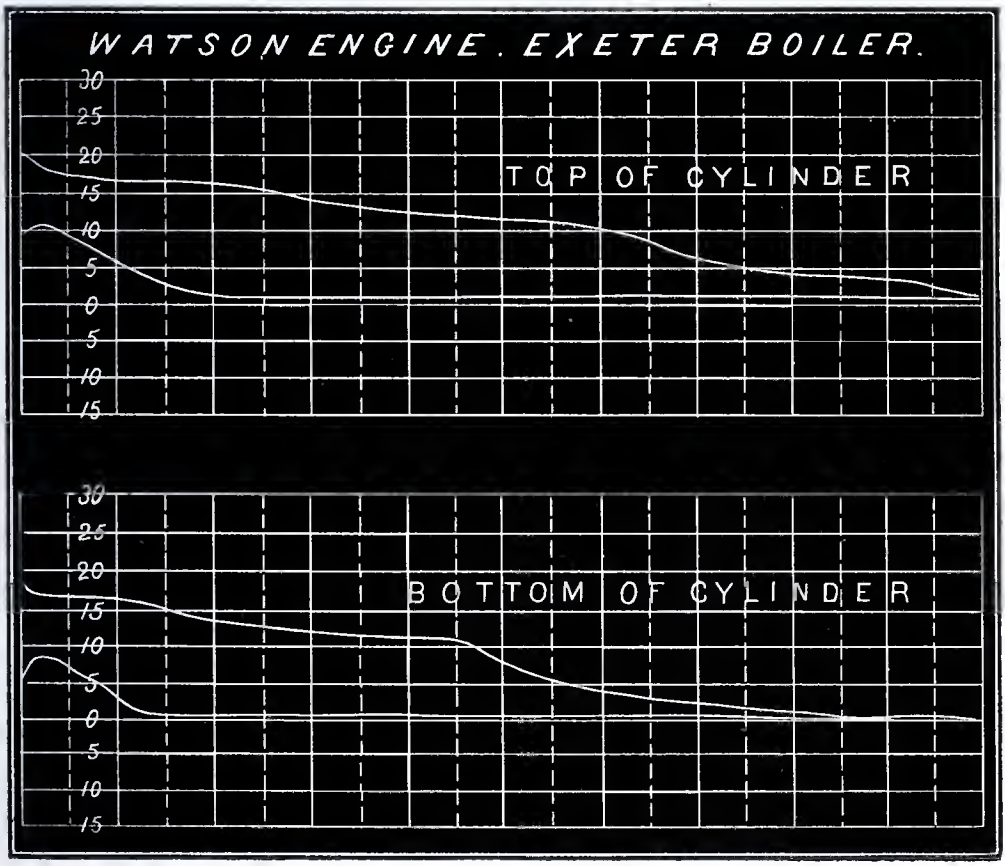
In practice this result cannot be realized, from the fact that a portion of the coal falls through the grate unburned, in addition to the heat conducted by the gases through the chimney, which reduces its efficiency.

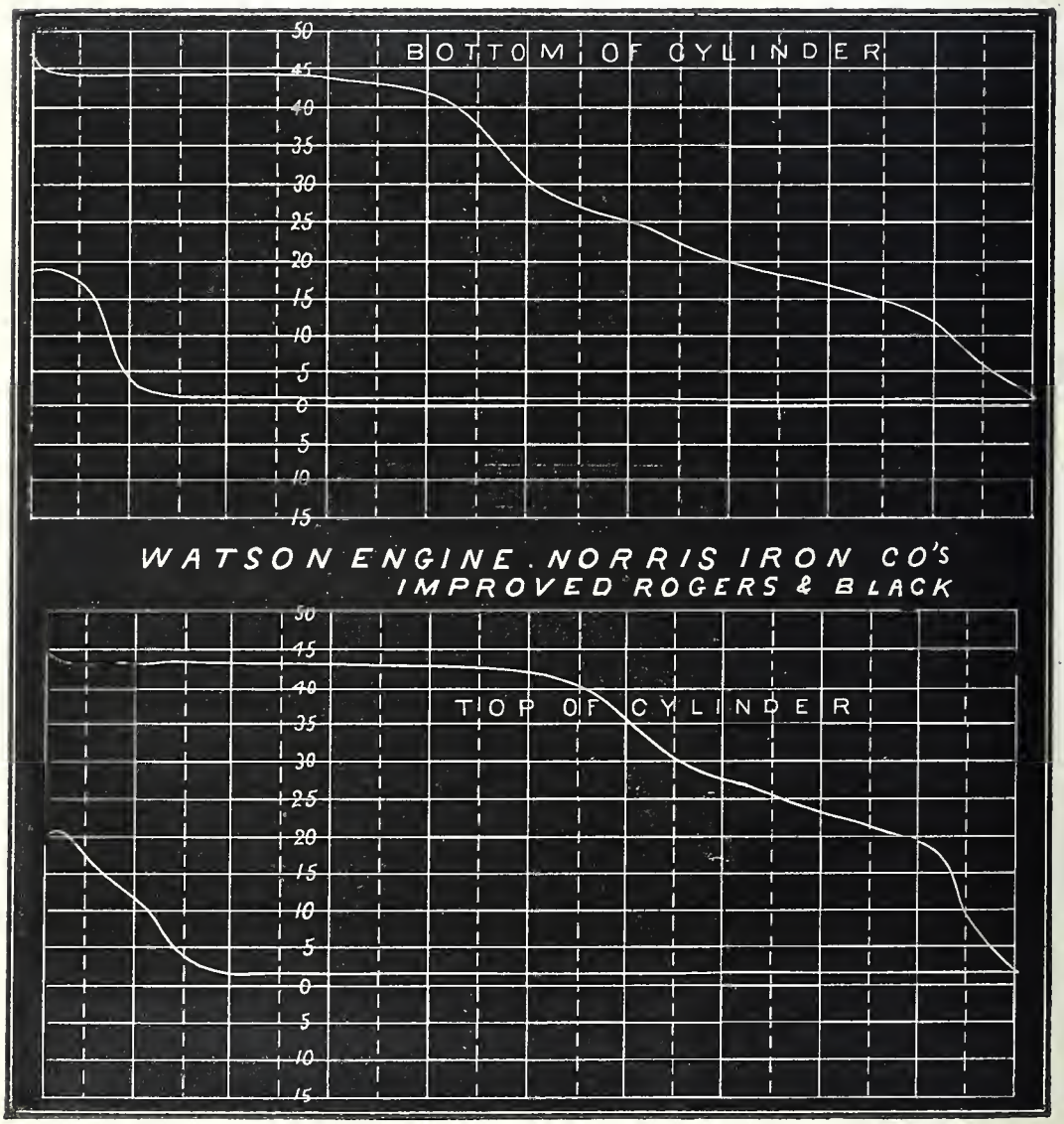
The heating value of the wood used in starting the fire was taken at one-third that of the coal.

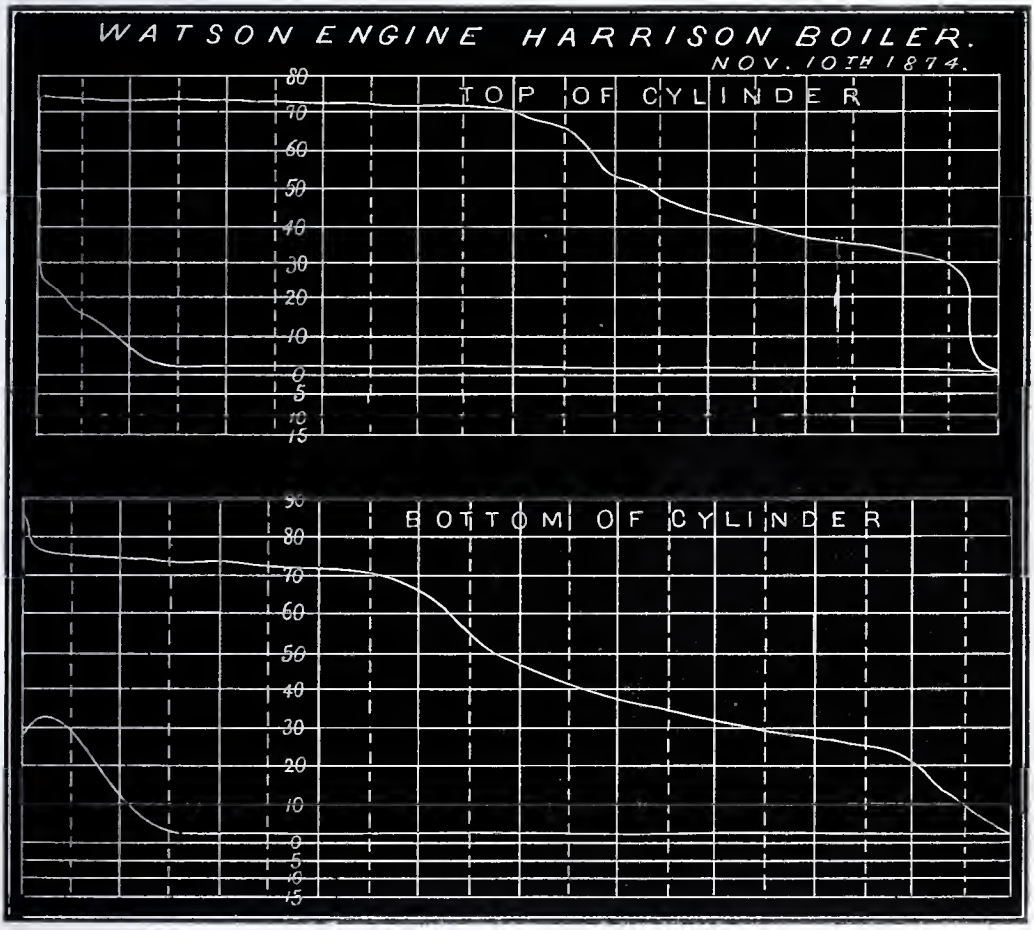
The data of these interesting trials are given in detail in the following tables, and the Judges hope they may be of value in comparing the results of future trials and also with the statements of boiler makers, who can make large claims of economy in fuel.

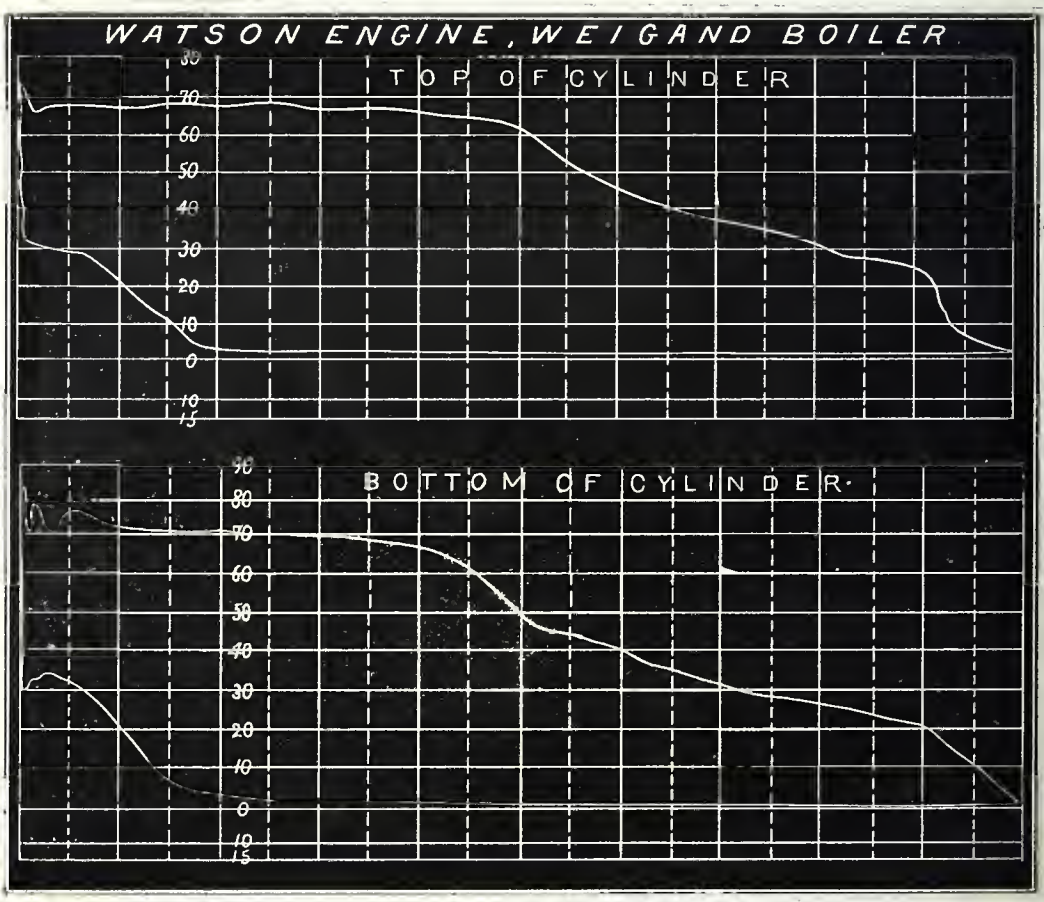
WASHINGTON JONES.
CYRUS CHAMBERS, JR.
JOHN H. COOPER.
A. H. MORGAN.
JOHN W. NYSTROM.
HENRY L. BUTLER.
ABRAM D. EMERY.
F. C. PRINDLE.
J. H. RISDON.
E. D. LEAVITT, JR.

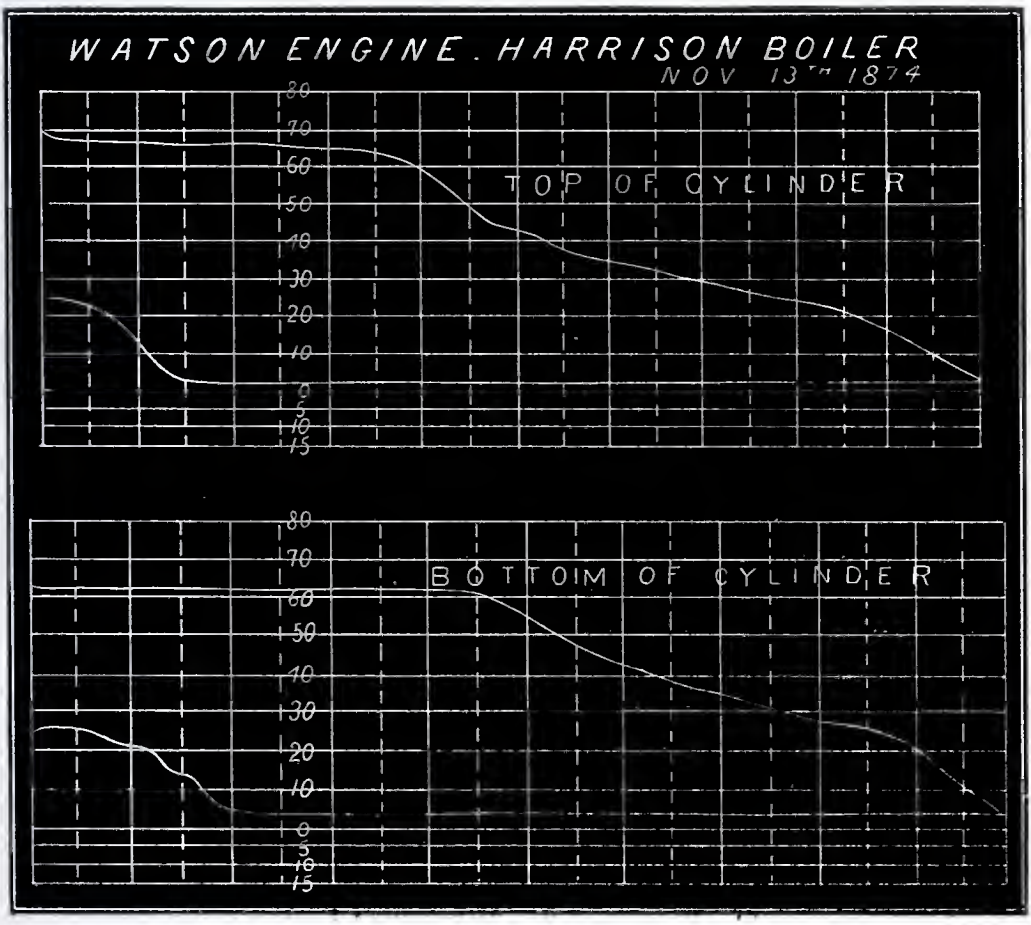
Committee.

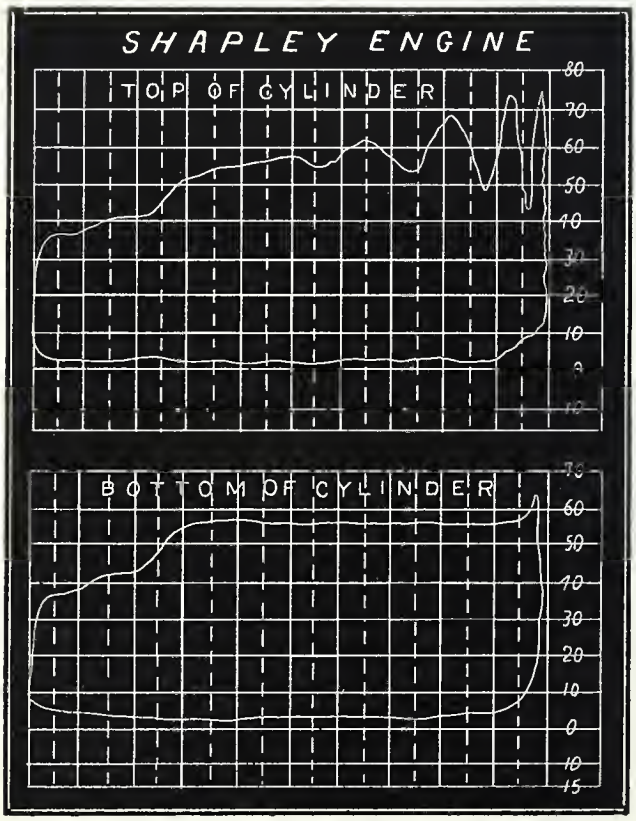

WATSON ENGINE. EXETER BOILER.
30
25
20
15
10
5
0
5
10
15
TOP OF CYLINDER
30
25
20
15
10
5
0
5
10
15
BOTTOM OF CYLINDER


BOTTOM OF CYLINDER
50
45
40
35
30
25
20
15
10
5
0
5
10
15
WATSON ENGINE. NORRIS IRON CO'S
IMPROVED ROGERS & BLACK
TOP OF CYLINDER
50
45
40
35
30
25
20
15
10
5
0
5
10
15


WATSON ENGINE HARRISON BOILER.
NOV. 10TH 1874.
TOP OF CYLINDER
80
70
60
50
40
30
20
10
0
5
10
15
BOTTOM OF CYLINDER
90
80
70
60
50
40
30
20
10
0
5
10
15


WATSON ENGINE, WEIGAND BOILER.
TOP OF CYLINDER
80
70
60
50
40
30
20
10
0
10
15
BOTTOM OF CYLINDER.
90
80
70
60
50
40
30
20
10
0
10
15


WATSON ENGINE. HARRISON BOILER
NOV 13TH 1874
TOP OF CYLINDER
BOTTOM OF CYLINDER
80
70
60
50
40
30
20
10
0
5
10
15


SHAPLEY ENGINE
TOP OF CYLINDER
80
70
60
50
40
30
20
10
0
10
BOTTOM OF CYLINDER
60
50
40
30
20
10
0
10
15

Franklin Institute.

TERMS AND PRIVILEGES OF MEMBERSHIP.

EACH MEMBER, AND ADULT HOLDER OF SECOND CLASS STOCK, when not in arrears for Dues, is entitled to attend the meetings of the Institute, the use of the Library and Reading Room, and to Tickets for himself and a lady to the Lectures.

CONTRIBUTING MEMBERS pay Five Dollars each year. The payment of Fifty Dollars in any one year secures Life-Membership without annual dues.

SHARES OF STOCK, Ten Dollars.

SECOND CLASS STOCK has an annual tax of Three Dollars per share, entitling the holder of one Share to the privileges of Membership.

THE HOLDER OF TEN OR MORE SHARES of First Class Stock is entitled to all the privileges of membership, without payment of annual dues.

MINOR CHILDREN, WARDS AND APPRENTICES of members not in arrears, by payment of Two Dollars, have use of Library and Reading Room and admission to Lectures, or Lectures alone for One Dollar.

MINORS, holding a share of Second Class Stock, by paying One Dollar and Fifty Cents per year, have use of Library and Reading Room, and admission to Lectures.

THE JOURNAL OF THE FRANKLIN INSTITUTE, Published Monthly; Subscription, Five Dollars per year, in advance. Members and Stockholders, not in arrears, can have one copy at Three Dollars per year, in advance.